

### SECTION III

#### DESCRIPTION OF THE URBANIZED AREAS

This section presents a summary and analysis of data on the following characteristics of urban areas:

- population, land area and location; and
- population density and land use distribution.

These categories are discussed below.

#### URBAN AREAS

Urban areas in this study have been taken as the 248 urbanized areas defined by the Bureau of the Census of the US Department of Commerce in the 1970 census and other urban areas. The 248 urbanized areas defined in 1970 are generally characterized as having:<sup>1</sup>

- a central city or urban core of 50,000 or more inhabitants;
- closely inhabited surroundings, consisting of incorporated places of 100 housing units or more; and small unincorporated parcels with population densities of 1,000 inhabitants per square mile or more (386 per square km); and
- other small unincorporated areas that may eliminate enclaves, square up the geometry of the urbanized area or provide a linkage to other enumeration districts fulfilling the overall criteria within 1 1/2 miles (2.4 km) of the main body of the urbanized area.

The distribution of urbanized areas across the United States is shown in Figure III-1, 1970 Urbanized Areas and Five Regions.

The choice of a sample of 50 urbanized areas was based upon a representative distribution reflecting variations in climate and geography. This sample of 20 percent of all urbanized areas was selected

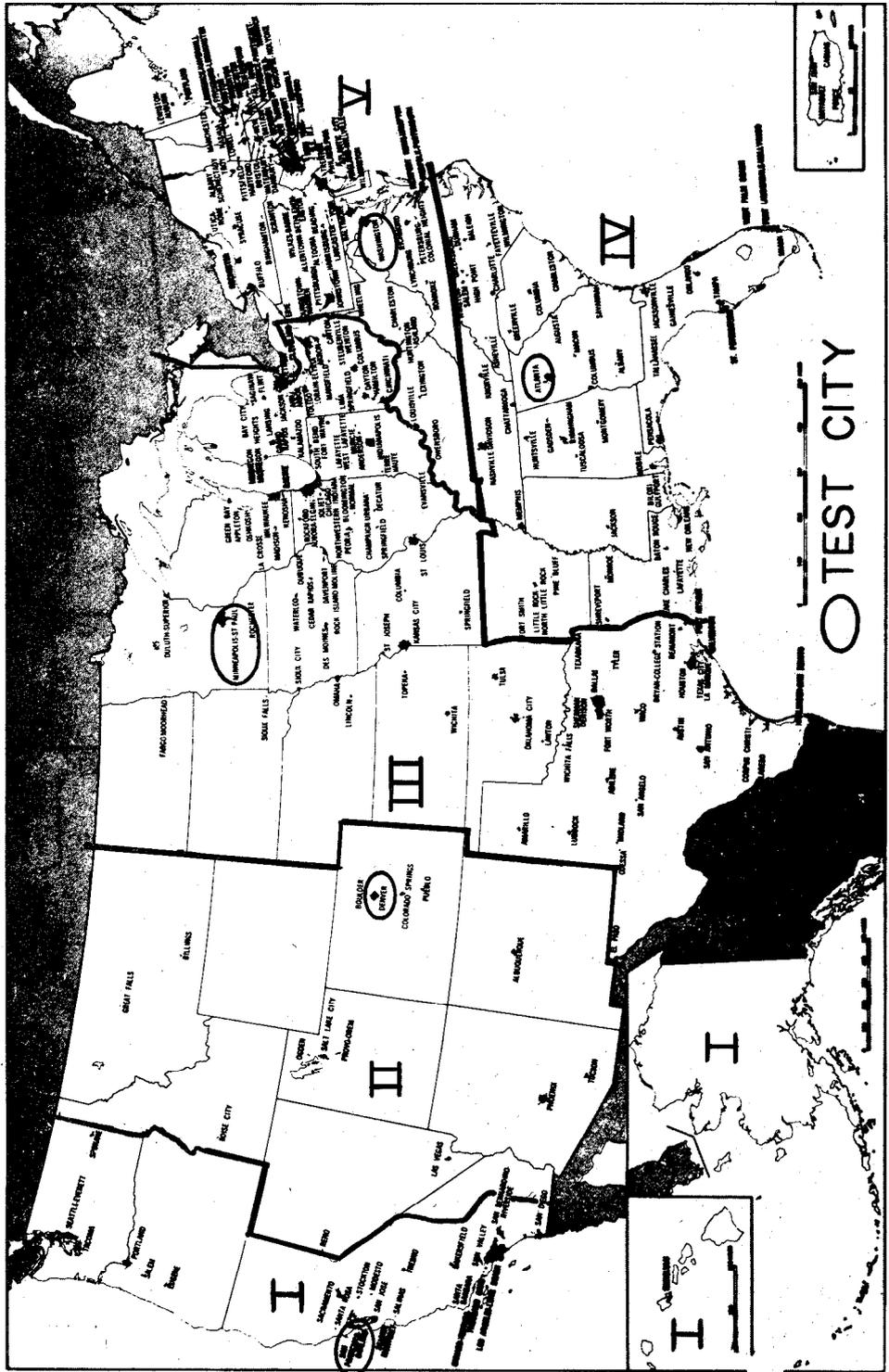


Figure III-1. 1970 Urbanized Areas and Five Regions

Source: US Bureau of the Census,  
County and City Data Book, 1972

for further analysis. The 50 selected urbanized areas are listed in Table III-1, Demographic Characteristics of the Urban Areas, along with the remaining urbanized areas and the residual urban areas not located within urbanized areas. These 50 urbanized areas are denoted under column 7, "CODE" with a C. All other cities are coded "E". The population distribution of the sample of urbanized areas was as follows:

<u>Population Range</u>	<u>Number of Urbanized Areas</u>
50,000 < Population < 100,000	7
100,000 < Population < 250,000	12
250,000 < Population < 500,000	11
500,000 < Population < 1,000,000	7
1,000,000 < Population	13

A sub-sample of the five cities selected for more intensive analysis (San Francisco, Denver, Minneapolis, Atlanta, and Washington, DC) is shown in Figure III-1 along with the five regions into which the country was partitioned.

#### POPULATION, LAND AREA, AND LOCATION

The 1970 census population and land area for each of the 248 urbanized areas were obtained from the County and City Data Book, 1972.<sup>1</sup> In addition, the total urban population for each state was obtained from the same source. If an urbanized area encompassed more than one state, its area and population were apportioned to the states based on the population of the major cities constituting the urbanized area. The results, presented by state and EPA region, are shown in Table III-1.

#### POPULATION DENSITY AND LAND USE DISTRIBUTION

The overall population density for an urbanized area may be obtained using the data in Table III-1. In general, population densities have decreased during the past generation reflecting the availability of improved transportation systems, the desire of individual home ownership, etc. No detailed data on urban land use for all of the urbanized areas in the US could be found.

For nine urbanized areas in Ontario, the area occupied by each of the following five types of land uses was determined: residential, institutional, industrial, commercial, and open space.<sup>2</sup> Land use maps, if available, were used. Aerial photographs were employed if land use

TABLE VII-1 DEMOGRAPHIC CHARACTERISTICS OF THE URBAN AREAS

EPA RFG	STATE ID	URBANIZED AREA	1000 ACRES	1970 POP 1000	POP AVE PD	CODE
1	CT	BRIDGEPORT	95.	413.	4.33	B
1	CT	BRISTOL	24.	72.	3.04	
1	CT	DANBURY	33.	67.	2.04	
1	CT	HARTFORD	84.	465.	5.55	
1	CT	MERIDEN	45.	98.	2.16	
1	CT	NEW BRITAIN	25.	131.	5.25	
1	CT	NEW HAVEN	62.	346.	5.58	
1	CT	NORWALK	37.	107.	2.98	
1	CT	STAMFORD	45.	185.	4.13	
1	CT	WATERBURY	32.	157.	4.99	
1	CT	OTHER URBAN AREAS	72.	301.	4.19	
1	CT	TOTAL FOR STATE	550.	2344.	4.19	
1	ME	LEWISTON	44.	65.	1.49	C
1	ME	PORTLAND	36.	106.	2.96	
1	ME	OTHER URBAN AREAS	156.	336.	2.15	
1	ME	TOTAL FOR STATE	235.	507.	2.15	
1	MA	BOSTON	425.	2652.	6.24	D
1	MA	BROCKTON	34.	149.	4.39	
1	MA	FALL RIVER	38.	139.	3.65	
1	MA	FITCHBURG	30.	78.	2.60	
1	MA	LAWRENCE	54.	200.	3.72	
1	MA	LOWELL	40.	183.	4.61	
1	MA	NEW BEDFORD	22.	134.	6.16	
1	MA	PITTSFIELD	22.	63.	2.24	
1	MA	SPRINGFIELD	152.	514.	3.37	
1	MA	WORCESTER	54.	247.	4.59	
1	MA	OTHER URBAN AREAS	91.	454.	4.98	
1	MA	TOTAL FOR STATE	966.	4813.	4.98	
1	NH	MANCHESTER	25.	95.	3.81	E
1	NH	NASHUA	22.	61.	2.80	
1	NH	OTHER URBAN AREAS	78.	261.	3.34	
1	NH	TOTAL FOR STATE	125.	417.	3.34	
1	RI	PROVIDENCE	156.	795.	5.09	C
1	RI	OTHER URBAN AREAS	6.	31.	5.09	
1	RI	TOTAL FOR STATE	162.	826.	5.09	
1	VT	URBAN AREAS	35.	143.	4.14	E
1	VT	TOTAL FOR STATE	35.	143.	4.14	
1		TOTAL FOR REGION 1	2082.	9050.	4.35	
2	NJ	ATLANTIC CITY	43.	134.	3.13	F
2	NJ	NEW YORK CITY METRO	1309.	5688.	4.35	
2	NJ	PHILADELPHIA METRO	31.	202.	6.44	
2	NJ	TRENTON	42.	274.	6.59	
2	NJ	VINELAND	54.	74.	1.36	
2	NJ	TOTAL FOR STATE	1479.	6372.	4.31	
2	NY	ALBANY	97.	486.	5.03	G
2	NY	BINGHAMPTON	33.	167.	5.02	
2	NY	BUFFALO	137.	1086.	7.95	
2	NY	NEW YORK CITY	243.	10519.	43.25	
2	NY	ROCHESTER	93.	601.	6.43	
2	NY	SYRACUSE	61.	376.	6.12	
2	NY	UTICA	48.	180.	3.75	
2	NY	OTHER URBAN AREAS	117.	2196.	18.82	
2	NY	TOTAL FOR STATE	830.	15611.	18.82	
2		TOTAL FOR REGION 2	2309.	21983.	9.52	

TABLE III-1 DEMOGRAPHIC CHARACTERISTICS OF THE URBAN AREAS

EPA RFG	STATE ID	URBANIZED AREA	1000 ACRES	1970 POP 1000	POP AVE PD	CODE
3	DE	WILMINGTON	70.	371.	5.27	C
3	DE	OTHER URBAN AREAS	5.	24.	5.27	
3	DE	TOTAL FOR STATE	75.	395.	5.27	
3	DC	WASHINGTON, D.C.	39.	757.	19.26	C
3	DC	TOTAL FOR STATE	39.	757.	19.26	
3	MD	BALTIMORE	198.	1580.	7.96	E
3	MD	WASHINGTON DC METRO	77.	473.	6.16	
3	MD	OTHER URBAN AREAS	122.	952.	7.46	
3	MD	TOTAL FOR STATE	403.	3005.	7.46	
3	PA	ALLENTOWN	63.	364.	5.74	F
3	PA	ALTOONA	133.	820.	6.11	
3	PA	ERIE	133.	1750.	13.16	
3	PA	HARRISBURG	133.	1750.	13.16	
3	PA	JOHNSTOWN	133.	960.	7.14	
3	PA	LANCASTER	133.	960.	7.14	
3	PA	PHILADELPHIA	4750.	28119.	59.82	
3	PA	PITTSBURGH	3850.	18460.	47.95	
3	PA	READING	236.	1504.	6.37	
3	PA	SCRANTON	236.	1504.	6.37	
3	PA	WILKES-BARRE	236.	1504.	6.37	
3	PA	YORK	236.	1504.	6.37	
3	PA	OTHER URBAN AREAS	156.	975.	6.24	
3	PA	TOTAL FOR STATE	1350.	8433.	6.24	
3	VA	LYNCHBURG	24.	71.	2.96	G
3	VA	NEWPORT NEWS	92.	268.	2.91	
3	VA	NORFOLK	191.	668.	3.49	
3	VA	PETERSBURG	37.	101.	2.73	
3	VA	RYCHMOND	93.	416.	4.47	
3	VA	ROANOKE	43.	157.	3.65	
3	VA	WASHINGTON DC METRO	100.	1251.	12.51	
3	VA	OTHER URBAN AREAS	0.	1.	0.01	
3	VA	TOTAL FOR STATE	560.	2933.	5.15	
3	WV	CHARLESTON	40.	158.	3.95	H
3	WV	HUNTINGTON	23.	121.	5.21	
3	WV	STEUBENVILLE METRO	17.	40.	2.34	
3	WV	WHEELING	18.	93.	5.19	
3	WV	OTHER URBAN AREAS	64.	268.	4.21	
3	WV	TOTAL FOR STATE	162.	680.	4.21	
3		TOTAL FOR REGION 3	2598.	14203.	5.24	

TABLE III-1 DEMOGRAPHIC CHARACTERISTICS OF THE URBAN AREAS

EPA RFG	STATE ID	URBANIZED AREA	1000 ACRES	1970 POP 1000	POP AVE PD	CODE
4	AL	BYRMINGHAM	144.	558.	3.88	M
4	AL	GADSDEN	35.	68.	1.93	
4	AL	HUNTSVILLE	79.	146.	1.85	
4	AL	MOBILE	108.	258.	2.40	
4	AL	MONTGOMERY	33.	139.	4.26	
4	AL	TUSCALOOSA	38.	86.	3.09	
4	AL	OTHER URBAN AREAS	257.	756.	2.94	
4	AL	TOTAL FOR STATE	683.	2011.	2.94	
4	FL	FT. LAUDERDALE	136.	614.	4.53	M
4	FL	GAINESVILLE	19.	59.	3.72	
4	FL	JACKSONVILLE	225.	530.	2.36	
4	FL	MIAMI	166.	1220.	7.36	
4	FL	ORLANDO	84.	305.	3.61	
4	FL	PENSACOLA	42.	167.	3.95	
4	FL	ST. PETERSBURG	103.	495.	4.80	
4	FL	TALAHASSEE	19.	78.	4.06	
4	FL	TAMPA	84.	369.	4.40	
4	FL	WEST PALM BEACH	87.	288.	3.31	
4	FL	OTHER URBAN AREAS	310.	1330.	4.29	
4	FL	TOTAL FOR STATE	1275.	5465.	4.29	
4	GA	ALBANY	21.	76.	3.60	M
4	GA	ATLANTA	278.	1173.	4.21	
4	GA	AUGUSTA	37.	149.	4.08	
4	GA	COLUMBUS	68.	209.	3.08	
4	GA	MACON	33.	128.	3.92	
4	GA	SAVANNAH	41.	164.	4.00	
4	GA	OTHER URBAN AREAS	210.	869.	3.97	
4	GA	TOTAL FOR STATE	697.	2748.	3.97	
4	KY	HUNTINGTON METRO	13.	47.	3.73	M
4	KY	LFXTINGTON	26.	160.	6.25	
4	KY	LOUISVILLE	134.	739.	5.50	
4	KY	OWENSBORO	8.	53.	6.90	
4	KY	OTHER URBAN AREAS	124.	688.	5.54	
4	KY	TOTAL FOR STATE	304.	1687.	5.54	
4	MS	BILOXI	41.	121.	2.95	M
4	MS	JACKSON	46.	160.	3.57	
4	MS	OTHER URBAN AREAS	189.	676.	3.57	
4	MS	TOTAL FOR STATE	276.	987.	3.57	
4	NC	ASHEVILLE	24.	72.	2.96	M
4	NC	CHAPLOTTE	68.	280.	4.13	
4	NC	DURHAM	38.	101.	3.67	
4	NC	FAYETTEVILLE	47.	161.	3.45	
4	NC	GRENSBORO	39.	152.	3.89	
4	NC	HIGHPOINT	33.	94.	2.82	
4	NC	RALFIGH	45.	152.	3.35	
4	NC	WYLMINGTON	10.	58.	5.86	
4	NC	WYNSTON-SALFM	42.	142.	3.36	
4	NC	OTHER URBAN AREAS	306.	1075.	3.51	
4	NC	TOTAL FOR STATE	651.	2287.	3.51	
4	SC	CHARLESTON	63.	228.	3.60	M
4	SC	COLUMBIA	66.	242.	3.67	
4	SC	GREENVILLE	45.	157.	3.46	
4	SC	OTHER URBAN AREAS	169.	606.	3.59	
4	SC	TOTAL FOR STATE	344.	1233.	3.59	
4	TN	CHATTANOOGA	75.	224.	2.99	M
4	TN	KNOXVILLE	55.	190.	3.45	
4	TN	MEMPHIS	125.	664.	5.29	
4	TN	NASHVILLE	220.	448.	2.03	
4	TN	OTHER URBAN AREAS	243.	781.	3.21	
4	TN	TOTAL FOR STATE	719.	2307.	3.21	
4		TOTAL FOR REGION 4	4949.	18745.	3.79	

TABLE III-1 DEMOGRAPHIC CHARACTERISTICS OF THE URBAN AREAS

EPA REG	STATE ID	URBANIZED AREA	1000 ACRES	1970 POP 1000	POP AVE PD	CODE
5	IL	ALTON	49.	233.	4.73	URBAN
		BLOMINGTON	13.	89.	6.88	
		CHAMPAIGN	12.	100.	8.33	
		CHICAGO	626.	5712.	9.13	
		DAVENPORT METRO	23.	112.	4.97	
		DECATUR	35.	150.	4.23	
		JOLIET	35.	156.	4.53	
		PEORIA	33.	156.	4.61	
		ROCKFORD	63.	247.	3.98	
		SPRINGFIELD	33.	171.	5.28	
IL	OTHER URBAN AREAS	279.	2163.	7.49		
5	IL	TOTAL FOR STATE	1189.	9221.	7.75	
5	IN	ANDERSON	27.	131.	4.84	URBAN
		CHICAGO METRO	191.	1000.	5.23	
		EVANSVILLE	26.	126.	4.81	
		FORT WAYNE	42.	205.	4.90	
		INDIANAPOLIS	244.	820.	3.36	
		LAFAYETTE	12.	79.	6.66	
		MUNCIE	16.	90.	5.62	
		SOUTH BEND	64.	308.	4.77	
		TERRA HAUTE	32.	156.	4.86	
		IN	OTHER URBAN AREAS	150.	545.	
5	IN	TOTAL FOR STATE	774.	3371.	4.33	
5	MI	ANN ARBOR	39.	179.	4.59	URBAN
		BAY CITY	17.	78.	4.59	
		DETROIT	558.	4970.	8.91	
		FLINT	61.	330.	5.41	
		GRAND RAPIDS	93.	535.	5.78	
		JACKSON	27.	133.	4.90	
		KALAMAZOO	47.	172.	3.65	
		LANSING	47.	152.	3.22	
		MUSKEGON	33.	106.	3.20	
		SAGINAW	28.	148.	5.26	
MI	OTHER URBAN AREAS	156.	635.	4.01		
5	MI	TOTAL FOR STATE	1092.	6559.	6.01	
5	MN	DULUTH	46.	105.	2.31	URBAN
		FARGO METRO	6.	31.	5.17	
		MINNEAPOLIS	461.	1704.	3.69	
		ROCHESTER	10.	57.	5.64	
		OTHER URBAN AREAS	173.	630.	3.63	
5	MN	TOTAL FOR STATE	694.	2527.	3.63	
5	OH	AKRON	131.	543.	4.16	URBAN
		CANTON	49.	244.	4.95	
		CINCINNATI	214.	1110.	5.18	
		CLEVELAND	413.	1960.	4.74	
		COLUMBUS	150.	790.	5.25	
		DAYTON	143.	636.	4.44	
		HAMILTON	24.	91.	3.74	
		LIMA	17.	70.	4.05	
		LORAIN	68.	192.	2.83	
		MANSFIELD	26.	78.	2.97	
		SPRINGFIELD	16.	94.	5.88	
		STEUBENVILLE	8.	45.	5.69	
		TOLEDO	106.	428.	4.05	
		YOUNGSTOWN	83.	339.	4.08	
OH	OTHER URBAN AREAS	264.	1235.	4.68		
5	OH	TOTAL FOR STATE	1714.	8021.	4.68	
5	WI	APPLETON	24.	130.	5.49	URBAN
		DULUTH METRO	26.	33.	1.27	
		GREEN BAY	50.	139.	2.78	
		KENOSHA	13.	82.	6.30	
		LA CROSSE	15.	67.	4.45	
		MADISON	42.	206.	4.90	
		MILWAUKEE	292.	1252.	4.28	
		OSHKOSH	12.	52.	4.33	
		RACINE	12.	52.	4.33	
		WI	OTHER URBAN AREAS	199.	843.	
5	WI	TOTAL FOR STATE	688.	2941.	4.23	
5		TOTAL FOR REGION 5	6157.	32610.	5.30	

TABLE III-1 DEMOGRAPHIC CHARACTERISTICS OF THE URBAN AREAS

EPA RFG	STATE ID	URBANIZED AREA	1000 ACRES	1970 POP 1000	POP AVE. PD	CODE
6	AR	FORT SMITH	38.	76.	1.98	F
6	AR	LITTLE ROCK	61.	233.	3.87	
6	AR	TYNE BLUFF	13.	61.	4.54	
6	AR	OTHER URBAN AREAS	188.	602.	3.20	
6	AR	TOTAL FOR STATE	301.	962.	3.20	
6	LA	BATON ROUGE	54.	249.	4.58	C
6	LA	LAFAYETTE	16.	78.	4.88	
6	LA	LAKE CHARLES	33.	88.	2.64	
6	LA	MONROE	55.	90.	1.62	
6	LA	NEW ORLEANS	54.	962.	17.89	
6	LA	SHREVEPORT	60.	234.	3.90	
6	LA	OTHER URBAN AREAS	96.	705.	7.34	
6	LA	TOTAL FOR STATE	328.	2406.	7.34	
6	NM	ALBUQUERQUE	73.	297.	4.07	C
6	NM	OTHER URBAN AREAS	102.	414.	4.07	
6	NM	TOTAL FOR STATE	175.	711.	4.07	
6	OK	LAWTON	28.	96.	3.41	F
6	OK	OKLAHOMA CITY	217.	580.	2.67	
6	OK	TULSA	115.	371.	3.22	
6	OK	OTHER URBAN AREAS	238.	693.	2.91	
6	OK	TOTAL FOR STATE	598.	1740.	2.91	
6	TX	ARILENE	5.	90.	1.80	C
6	TX	AMARILLO	5.	127.	2.54	
6	TX	AUSTIN	55.	264.	4.80	
6	TX	BEAUMONT	43.	116.	2.70	
6	TX	BROWNSVILLE	10.	51.	5.10	
6	TX	BRYAN	31.	51.	1.65	
6	TX	CORPUS CHRISTI	48.	114.	2.38	
6	TX	DALLAS	431.	1333.	3.08	
6	TX	EL PASO	77.	337.	4.37	
6	TX	FORT WORTH	253.	677.	2.69	
6	TX	GALVESTON	15.	50.	3.33	
6	TX	HARLINGEN	22.	20.	0.91	
6	TX	HOUSTON	345.	1678.	4.86	
6	TX	LARFDO	14.	70.	5.07	
6	TX	LUBBOCK	49.	150.	3.06	
6	TX	MCAILLEN	21.	91.	4.33	
6	TX	MIDLAND	22.	60.	2.73	
6	TX	ODDESSA	15.	32.	2.13	
6	TX	PORT ARTHUR	47.	116.	2.47	
6	TX	SAN ANGELO	22.	64.	2.91	
6	TX	SAN ANTONIO	143.	772.	5.41	
6	TX	SHERMAN	22.	55.	2.50	
6	TX	TEXARKANA	20.	58.	2.90	
6	TX	TEXAS CITY	53.	34.	0.64	
6	TX	TYLER	16.	60.	3.75	
6	TX	WACO	53.	119.	2.25	
6	TX	WICHITA FALL	27.	98.	3.63	
6	TX	OTHER URBAN AREAS	570.	1999.	3.45	
6	TX	TOTAL FOR STATE	2546.	8934.	3.51	
6		TOTAL FOR REGION 6	3948.	14753.	3.74	

TABLE III-1 DEMOGRAPHIC CHARACTERISTICS OF THE URBAN AREAS

EPA REG	STATE ID	URBANIZED AREA	1960 ACRES	1970 POP 1000	POP AVE PD	CODE
7	IA	CFDAR RAPIDS	40.	132.	3.33	E
7	IA	DAVENPORT	53.	114.	2.15	
7	IA	DES MOINES	70.	255.	3.66	
7	IA	DUBUIQUE	12.	65.	5.35	
7	IA	STOUX CITY	32.	96.	2.50	
7	IA	WATERLOO	44.	113.	2.56	
7	IA	OTHER URBAN AREAS	279.	840.	3.01	
7	IA	TOTAL FOR STATE	536.	1615.	3.01	
7	KS	KANSAS CITY METRO	55.	274.	4.98	E
7	KS	TOPEKA	34.	132.	3.89	
7	KS	WYCHITA	67.	302.	4.49	
7	KS	OTHER URBAN AREAS	171.	777.	4.53	
7	KS	TOTAL FOR STATE	327.	1485.	4.53	
7	MO	COLUMBIA	27.	59.	2.19	E
7	MO	KANSAS CITY	260.	828.	3.18	
7	MO	SPRINGFIELD	40.	121.	3.00	
7	MO	ST. JOSEPH	30.	77.	3.76	
7	MO	ST. LOUIS	295.	1883.	6.38	
7	MO	OTHER URBAN AREAS	67.	310.	4.61	
7	MO	TOTAL FOR STATE	710.	3278.	4.61	
7	NE	LINCOLN	33.	153.	4.60	E
7	NE	OMAHA	97.	492.	5.09	
7	NE	OTHER URBAN AREAS	54.	268.	4.96	
7	NE	TOTAL FOR STATE	184.	913.	4.96	
7		TOTAL FOR REGION 7	1758.	7291.	4.15	
8	CO	BOULDER	9.	49.	7.70	E
8	CO	COLORADO SPRINGS	58.	205.	3.56	
8	CO	DENVER	182.	1047.	5.83	
8	CO	PUEBLO	20.	103.	5.13	
8	CO	OTHER URBAN AREAS	60.	313.	5.19	
8	CO	TOTAL FOR STATE	338.	1737.	5.19	
8	MT	BILLINGS	17.	71.	4.11	E
8	MT	GREAT FALLS	14.	71.	5.04	
8	MT	OTHER URBAN AREAS	51.	230.	4.53	
8	MT	TOTAL FOR STATE	82.	372.	4.53	
8	ND	FARGO	10.	54.	5.51	C
8	ND	OTHER URBAN AREAS	40.	220.	5.51	
8	ND	TOTAL FOR STATE	50.	274.	5.51	
8	SD	STOUX FALLS	17.	75.	4.34	C
8	SD	OTHER URBAN AREAS	51.	222.	4.34	
8	SD	TOTAL FOR STATE	68.	297.	4.34	
8	UT	OGDEN	39.	150.	3.84	E
8	UT	PROVO	42.	104.	2.50	
8	UT	SALT LAKE CITY	118.	479.	4.07	
8	UT	OTHER URBAN AREAS	33.	121.	3.69	
8	UT	TOTAL FOR STATE	231.	854.	3.69	
8	WY	URBAN AREAS	49.	201.	4.08	E
8	WY	TOTAL FOR STATE	49.	201.	4.08	
8		TOTAL FOR REGION 8	816.	3735.	4.58	

TABLE III-1 DEMOGRAPHIC CHARACTERISTICS OF THE URBAN AREAS

EPA REG	STATE ID	URBANIZED AREA	1000 ACRES	1970 POP 1000	POP AVE PD	CODE
9	AK	URBAN AREAS	49.	147.	2.99	E
9	AK	TOTAL FOR STATE	49.	147.	2.99	
9	AZ	PHOENIX	248.	863.	3.48	C
9	AZ	TUCSON	67.	294.	4.38	C
9	AZ	OTHER URBAN AREAS	68.	251.	3.67	
9	AZ	TOTAL FOR STATE	384.	1408.	3.67	
9	CA	BAKERSFIELD	36.	176.	4.82	E
9	CA	FRENO	51.	263.	5.20	
9	CA	LOS ANGELES	1006.	351.	3.30	
9	CA	MODESTO	22.	106.	4.87	
9	CA	ODYNARD	72.	245.	3.42	
9	CA	SACRAMENTO	156.	634.	4.06	
9	CA	SALINAS	10.	62.	6.46	
9	CA	SAN BERNARDINO	198.	584.	2.94	
9	CA	SAN DIEGO	244.	1198.	4.91	
9	CA	SAN FRANCISCO	436.	2988.	6.86	
9	CA	SAN JOSE	177.	1025.	5.78	
9	CA	SANTA BARBARA	24.	130.	5.49	
9	CA	SANTA ROSA	24.	75.	3.08	
9	CA	SEASIDE	15.	93.	6.25	
9	CA	STY VALLEY	16.	57.	3.56	
9	CA	STOCKTON	30.	160.	5.32	
9	CA	OTHER URBAN AREAS	311.	1995.	6.41	
9	CA	TOTAL FOR STATE	2828.	18142.	6.41	
9	HI	HONOLULU	74.	442.	6.01	E
9	HI	OTHER URBAN AREAS	33.	196.	6.01	
9	HI	TOTAL FOR STATE	106.	638.	6.01	
9	NV	LAS VEGAS	77.	237.	3.06	E
9	NV	RENO	24.	100.	4.11	C
9	NV	OTHER URBAN AREAS	18.	59.	3.31	
9	NV	TOTAL FOR STATE	120.	396.	3.31	
9		TOTAL FOR REGION 9	3487.	20731.	5.95	
10	ID	BOISE	19.	85.	4.58	C
10	ID	OTHER URBAN AREAS	66.	302.	4.58	
10	ID	TOTAL FOR STATE	85.	387.	4.58	
10	OR	EUGENE	35.	139.	3.95	E
10	OR	PORTLAND	171.	825.	4.83	
10	OR	SALEM	24.	93.	3.93	
10	OR	OTHER URBAN AREAS	75.	346.	4.60	
10	OR	TOTAL FOR STATE	305.	1403.	4.60	
10	WA	SEATTLE	264.	1238.	4.68	E
10	WA	SPOKANE	50.	230.	4.61	
10	WA	TACOMA	83.	332.	4.02	
10	WA	OTHER URBAN AREAS	149.	675.	4.54	
10	WA	TOTAL FOR STATE	546.	2475.	4.54	
10		TOTAL FOR REGION 10	935.	4265.	4.56	
		TOTAL FOR THE U.S.	29037.	149366.	5.14	

maps were unavailable. These photos presented a problem, in that they were taken at altitudes (1.6 miles or 2.6 km, approximately) that made differentiating among land uses difficult. The percentage of the land use in each of these five categories is shown in Table III-2, Land Use Distributions in Nine Ontario Cities. Note that, with the exception of West Toronto which has a very high average population density (40.1 persons per acre or 99 persons per ha), a large percent of the "urbanized" area falls in the open space category. This large amount of open space results from the definition of urbanized areas which includes population densities as low as one person per acre (2.5 persons per ha). Thus, this definition includes significant acreages of land which are undeveloped and would not be served by sewerage systems.

Manvel et al. present data on land use in 106 US cities.<sup>3</sup> Analysis of these data indicates that the proportion of the urbanized area in each land use category was relatively similar after deducting for the proportion of the urbanized area which is in the "undeveloped" category. This category is deducted from the total urbanized area to obtain the developed portion of the urbanized area. Figure III-2, Percent Undeveloped Land Use (US) and Open Space Land Use (Ontario) vs Population Density, shows the percent undeveloped land as a function of population density for the US cities and the percent open land for the Ontario cities. The "open" category would include undeveloped land and developed open space land, e.g., parks. As can be seen from Figure III-2, the Ontario cities generally fall above the line of best fit for the US undeveloped land. This result appears reasonable since the "open space" category would include the "undeveloped" land. Thus, it seemed reasonable to use the US equation to estimate the percent of the urbanized area which is undeveloped, i.e.,

$$Z = 1.0 e^{-0.170(PD)} \quad (r = -0.57) \quad (III-1)$$

where  $Z$  = proportion undeveloped land,

$PD$  = average gross (developed and undeveloped) population density, persons per acre, and

$r$  = correlation coefficient ( $-1.0 \leq r \leq 1.0$ ).

Using this relationship, then the developed population density,  $PD_d$ , can be expressed as a function of the gross population density using

$$PD_d = \frac{PD}{(1-Z)} = \frac{PD e^{0.17PD}}{e^{0.17PD} - 1} \quad (III-2)$$

TABLE III-2. LAND USE DISTRIBUTIONS IN NINE ONTARIO CITIES<sup>a</sup>

Urbanized Area	Population Density Persons/acre (persons/ha)	% of Urbanized Area in Indicated Land Use					Total
		Residential	Commercial	Industrial	Institutional	Open	
Burlington	5.84 (14.42)	34.0	3.0	3.0	5.0	55.0	100
Guelph	5.01 (12.37)	29.0	3.0	8.0	6.0	54.0	100
Kingston	10.39 (25.66)	32.0	5.0	7.0	12.0	44.0	100
Kitchener-Waterloo	6.70 (16.55)	27.0	4.0	10.0	2.0	57.0	100
St. Catharines	6.56 (16.20)	41.0	4.0	6.0	6.0	43.0	100
Sault Ste. Marie	5.56 (13.73)	40.0	4.0	19.0	4.0	33.0	100
Thunder Bay	6.89 (17.02)	34.0	13.0	12.0	6.0	35.0	100
Toronto, West	40.10 (99.05)	58.0	19.0	14.0	4.0	5.0	100
Windsor	7.63 (18.85)	38.0	6.0	10.0	3.0	43.0	100
Average	10.52 (25.98)	37.0	6.8	9.9	5.3	41.0	100

<sup>a</sup> American Public Works Association and University of Florida, "Evaluation of the Magnitude and Significance of Pollution Loading from Urban Stormwater Runoff - Ontario," Environmental Protection Service and Ontario Ministry of Environment, Toronto, 1976.

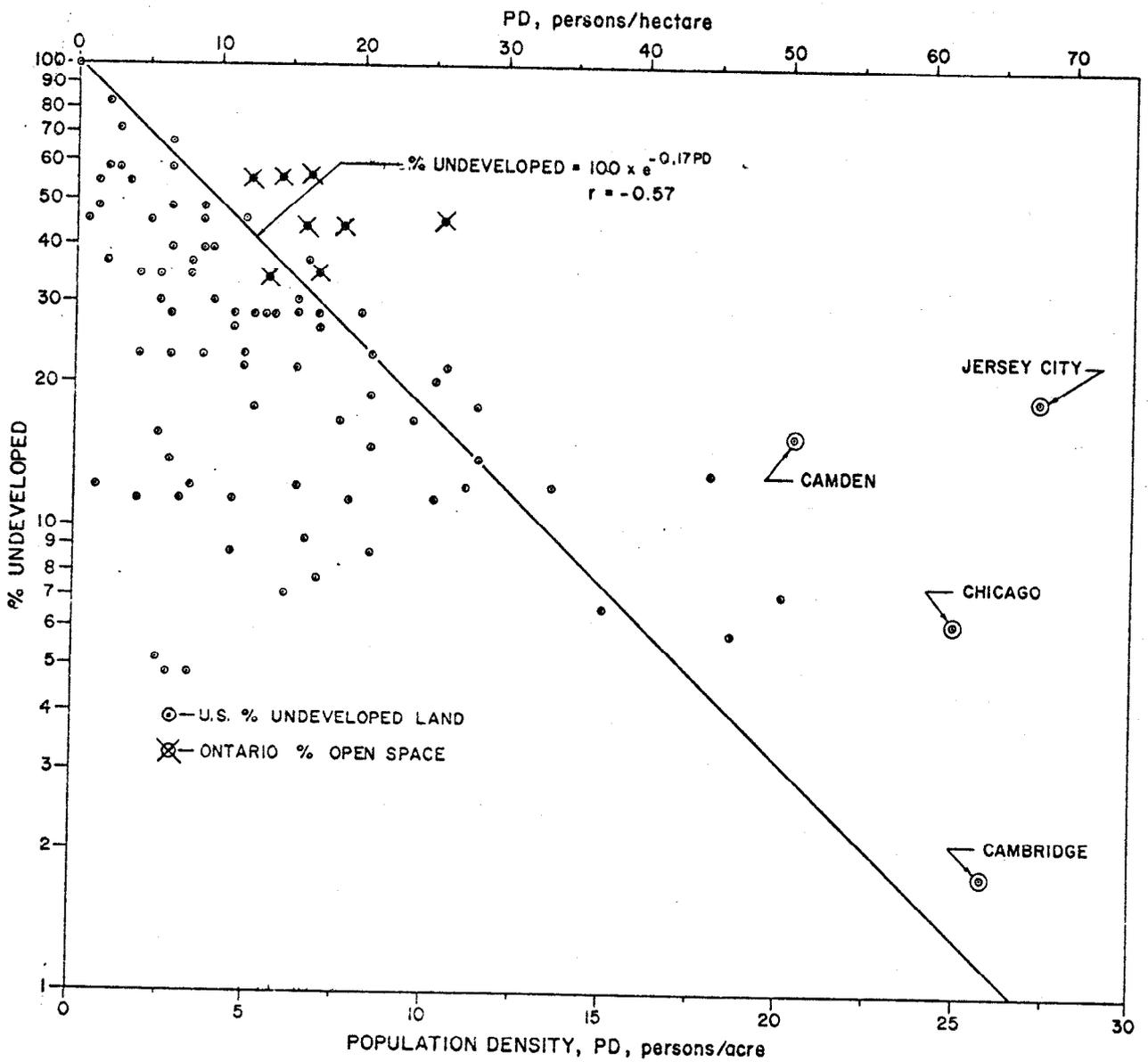


Figure III-2. Percent Undeveloped Land Use (US) and Open Space Land Use (Ontario) vs Population Density. Note that best fit line is forced through point 100 percent at PD = 0.

Equation III-2 is shown in Figure III-3, Relationship Between Gross and Developed Population Density. Note that the developed population density is about six persons per acre at the lowest level of urbanization (one person per acre). The developed population density approaches the gross population density as PD increases. Indeed, they are quite close at PD  $\geq$  25 persons per acre (62 persons per ha).

After correcting for the percent undeveloped, the proportion of the land in the developed uses was determined as a percent of developed urban land only. After this transformation was made, the percent of land in the developed uses was statistically independent of population density. The resultant distribution of developed land by use and undeveloped land is shown in Table III-3, Distribution of Developed Land Uses in Ontario Test Cities and US Cities. Note the similarity of the Ontario and US land use distributions.

The land distributions for all US cities are determined using equation III-1 and the US land use distributions shown in Table III-3. The results are presented in Table III-4, Land Use Distribution for the Urban Areas in the United States. In determining the control costs, only the developed portion of the urbanized area is considered. Thus, it is important to check the validity of this assumption in future assessments. Actual field data need to be gathered and analyzed using a consistent set of assumptions regarding land use categories.

Table III-3. DISTRIBUTION OF DEVELOPED LAND USES IN ONTARIO TEST CITIES AND US CITIES

Land Use	% of Total	
	Ontario <sup>b</sup>	US
Residential	52.5	58.4
Commercial	9.0	8.6
Industrial	14.1	14.8
Other <sup>a</sup>	24.4	18.2

<sup>a</sup>Recreational, schools and colleges, and cemeteries.

<sup>b</sup>American Public Works Association and University of Florida, "Evaluation of the Magnitude and Significance of Pollution Loading from Urban Stormwater Runoff - Ontario," Environmental Protection Service and Ontario Ministry of Environment, Toronto, 1976.

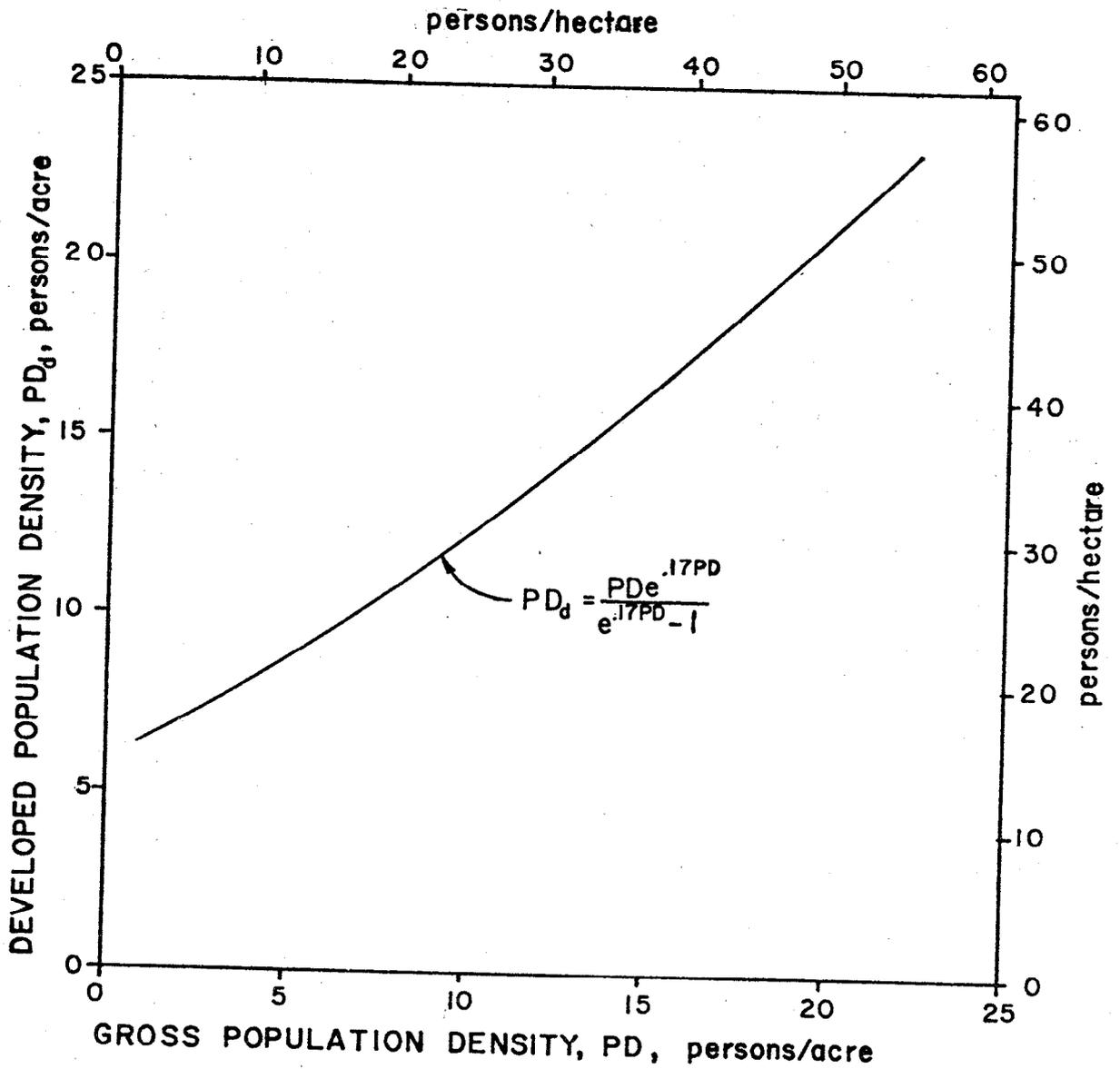


Figure III-3. Relationship Between Gross and Developed Population Density

TABLE III-4 LAND USE DISTRIBUTION FOR THE URBAN AREAS IN THE U.S.

EPA RFG	STATE	URBANIZED AREA	LAND USE AS % OF TOTAL AREA					TOTAL
			INDV	RES	COMM	INDL	OTH	
1	CT	BRIDGEPORT	47.9	30.4	4.4	7.7	9.5	100.0
1	CT	BRISTOL	59.6	33.6	4.4	5.0	7.5	100.0
1	CT	DANBURY	72.4	16.1	4.4	4.1	5.5	100.0
1	CT	HARTFORD	39.0	35.7	4.4	9.9	11.0	100.0
1	CT	MFRIDEN	69.3	17.9	4.4	4.4	6.0	100.0
1	CT	NEW BRITAIN	41.0	34.3	4.4	4.4	11.5	100.0
1	CT	NEW HAVEN	42.2	33.3	4.4	4.4	10.5	100.0
1	CT	NORWALK	50.8	28.7	4.4	7.7	8.8	100.0
1	CT	STAMFORD	49.6	29.0	4.4	7.7	8.8	100.0
1	CT	WATERBURY	49.0	29.0	4.4	7.7	9.9	100.0
1	CT	OTHER URBAN AREAS	50.0	29.2	4.4	7.7	9.9	100.0
1	CT	AVE. FOR STATE	50.0	29.2	4.3	7.4	9.1	100.0
1	ME	LEWISTON	77.6	13.1	1.1	3.3	4.4	100.0
1	ME	PORTLAND	60.2	23.1	2.2	5.5	7.7	100.0
1	ME	OTHER URBAN AREAS	69.9	17.6	2.2	4.5	5.5	100.0
1	ME	AVE. FOR STATE	69.9	17.6	2.6	4.5	5.5	100.0
1	MA	BOSTON	34.6	32.2	5.5	9.7	11.9	100.0
1	MA	BROCKTON	47.4	30.7	4.4	8.8	9.9	100.0
1	MA	FALL RIVER	42.4	33.7	5.5	4.4	10.5	100.0
1	MA	FITCHBURG	71.2	16.2	4.4	4.4	6.0	100.0
1	MA	LAWRENCE	45.7	31.7	4.4	4.4	9.9	100.0
1	MA	LOWELL	45.7	31.7	4.4	4.4	9.9	100.0
1	MA	NEW BEDFORD	35.1	37.9	5.5	4.4	8.8	100.0
1	MA	PITTSFIELD	68.4	12.5	5.5	7.7	11.5	100.0
1	MA	SPRINGFIELD	56.3	25.5	4.4	7.7	9.9	100.0
1	MA	WORCESTER	45.8	31.7	4.4	4.4	9.9	100.0
1	MA	OTHER URBAN AREAS	44.2	32.6	4.4	8.8	10.2	100.0
1	MA	AVE. FOR STATE	44.2	32.6	4.8	8.3	10.2	100.0
1	NH	MANCHESTER	52.4	27.8	4.4	7.1	8.7	100.0
1	NH	NASHUA	62.1	22.1	3.3	5.6	6.9	100.0
1	NH	OTHER URBAN AREAS	56.9	25.2	3.7	6.4	7.8	100.0
1	NH	AVE. FOR STATE	56.9	25.2	3.7	6.4	7.8	100.0
1	RI	PROVIDENCE	42.1	33.8	5.0	8.6	10.5	100.0
1	RI	OTHER URBAN AREAS	42.1	33.8	5.0	8.6	10.5	100.0
1	RI	AVE. FOR STATE	42.1	33.8	5.0	8.6	10.5	100.0
1	VT	URBAN AREAS	49.5	29.5	4.3	7.5	9.2	100.0
1	VT	AVE. FOR STATE	49.5	29.5	4.3	7.5	9.2	100.0
1		AVE. FOR REGION 1	49.3	29.6	4.4	7.5	9.2	100.0
2	NJ	ATLANTIC CITY	58.8	24.1	3.5	6.1	7.5	100.0
2	NJ	NEW YORK CITY METRO	47.8	30.5	4.5	7.7	9.5	100.0
2	NJ	PHILADELPHIA METRO	33.5	38.9	5.7	9.8	12.1	100.0
2	NJ	TRENTON	32.6	39.3	5.8	10.0	12.3	100.0
2	NJ	VIRGINIA	79.4	12.1	1.8	3.1	3.8	100.0
2	NJ	AVE. FOR STATE	48.5	30.1	4.4	7.6	9.4	100.0
2	NY	ALBANY	42.5	33.6	4.9	8.5	10.5	100.0
2	NY	BINGHAMTON	42.6	33.5	4.9	8.5	10.5	100.0
2	NY	BUFFALO	26.0	43.2	6.4	11.0	13.4	100.0
2	NY	NEW YORK CITY	0.1	58.4	8.6	14.8	17.1	100.0
2	NY	ROCHESTER	33.5	38.8	5.7	9.8	12.1	100.0
2	NY	SYRACUSE	35.3	37.8	5.6	9.6	11.8	100.0
2	NY	UTICA	52.9	27.5	4.1	7.0	8.6	100.0
2	NY	OTHER URBAN AREAS	23.8	44.5	6.6	11.3	13.9	100.0
2	NY	AVE. FOR STATE	23.8	44.5	6.6	11.3	13.9	100.0
2		AVE. FOR REGION 2	39.6	35.3	5.2	8.9	11.0	100.0

TABLE III-4 LAND USE DISTRIBUTION FOR THE URBAN AREAS IN THE U.S.

EPA REG	STATE	URBANIZED AREA	LAND USE AS % OF TOTAL AREA					
			INDV RES	COMM	INDL	OTH	TOTAL	
3	DE	WILMINGTON	40.8	34.6	5.1	8.8	10.8	100.0
3	DE	OTHER URBAN AREAS	40.8	34.6	5.1	8.8	10.8	100.0
3	DE	AVE. FOR STATE	40.8	34.6	5.1	8.8	10.8	100.0
3	DC	WASHINGTON, D.C.	3.8	56.2	8.3	14.2	17.5	100.0
3	DC	AVE. FOR STATE	3.8	56.2	8.3	14.2	17.5	100.0
3	MD	BALTIMORE	25.8	43.3	6.4	11.0	13.5	100.0
3	MD	WASHINGTON DC METRO	35.1	37.0	5.6	9.6	11.8	100.0
3	MD	OTHER URBAN AREAS	28.4	41.8	6.2	10.6	13.0	100.0
3	MD	AVE. FOR STATE	28.4	41.8	6.2	10.6	13.0	100.0
3	PA	ALLENTOWN	37.7	36.4	5.4	9.0	12.3	100.0
3	PA	ALTOONA	33.7	38.7	5.7	9.2	11.1	100.0
3	PA	EPIC	34.8	38.7	5.6	9.7	11.0	100.0
3	PA	HARRISBURG	44.0	32.1	4.8	9.3	10.9	100.0
3	PA	JOHNSTOWN	40.2	34.9	5.1	8.8	10.9	100.0
3	PA	LANCASTER	35.1	32.1	4.7	8.1	10.0	100.0
3	PA	PHILADELPHIA	23.6	44.6	6.6	11.3	13.0	100.0
3	PA	PITTSBURGH	43.9	32.7	4.8	8.3	10.2	100.0
3	PA	READING	33.7	38.7	5.7	9.0	12.0	100.0
3	PA	SCRANTON	27.5	24.8	3.7	6.3	7.7	100.0
3	PA	ATLICKES-BAPPE	49.0	29.8	4.4	6.6	9.3	100.0
3	PA	YORK	41.4	38.2	5.0	7.7	10.7	100.0
3	PA	OTHER URBAN AREAS	36.3	37.2	5.5	9.4	11.6	100.0
3	PA	AVE. FOR STATE	36.3	37.2	5.5	9.4	11.6	100.0
3	VA	LYNCHBURG	56.1	25.5	3.4	6.5	8.0	100.0
3	VA	NEWPORT NEWS	60.8	22.9	3.8	5.8	7.1	100.0
3	VA	NORFOLK	55.0	26.1	3.8	5.6	7.1	100.0
3	VA	PETERSBURG	52.3	27.5	4.1	5.9	8.6	100.0
3	VA	RICHMOND	46.7	31.1	4.6	7.7	9.7	100.0
3	VA	ROANOKE	53.2	27.4	4.7	6.0	8.5	100.0
3	VA	WASHINGTON DC METRO	12.0	51.4	7.0	13.0	16.0	100.0
3	VA	OTHER URBAN AREAS	46.9	31.0	4.6	7.9	9.7	100.0
3	VA	AVE. FOR STATE	46.9	31.0	4.6	7.9	9.7	100.0
3	WV	CHARLESTON	50.8	28.7	4.2	7.3	9.0	100.0
3	WV	HUNTINGTON	36.3	37.2	5.5	9.0	11.6	100.0
3	WV	STEUBENVILLE METRO	61.4	22.6	3.3	5.7	7.0	100.0
3	WV	MARTINSBURG	41.4	34.2	5.0	8.7	10.7	100.0
3	WV	OTHER URBAN AREAS	47.5	30.7	4.5	7.8	9.6	100.0
3	WV	AVE. FOR STATE	47.5	30.7	4.5	7.8	9.6	100.0
3		AVE. FOR REGION 3	37.7	36.4	5.4	9.2	11.3	100.0

TABLE III-4 LAND USE DISTRIBUTION FOR THE URBAN AREAS IN THE U.S.

EPA REG	STATE ID	URBANIZED AREA	LAND USE AS % OF TOTAL AREA					TOTAL
			INDV	RFS	COMM	INDL	OTH	
4	AL	BIRMINGHAM	51.7	22.2	4.1	7.1	8.8	100.0
4	AL	GADSDEN	72.0	16.3	1.0	4.1	5.6	100.0
4	AL	HUNTSVILLE	73.0	15.8	1.0	4.1	5.9	100.0
4	AL	MOBILE	66.8	10.6	1.0	5.7	6.9	100.0
4	AL	MONTGOMERY	48.9	10.1	1.0	7.4	6.6	100.0
4	AL	TUSCALOOSA	59.3	13.7	1.0	5.5	6.9	100.0
4	AL	OTHER URBAN AREAS	41.3	22.6	3.3	5.7	7.0	100.0
4	AL	AVE. FOR STATE	61.3	22.6	3.3	5.7	7.0	100.0
4	FL	FT. LAUDERDALE	46.3	31.3	4.4	7.5	9.9	100.0
4	FL	GAINESVILLE	53.3	27.3	4.4	6.6	8.5	100.0
4	FL	JACKSONVILLE	47.0	19.3	2.8	6.6	6.6	100.0
4	FL	MIAMI	28.8	41.7	10.4	10.4	10.4	100.0
4	FL	ORLANDO	44.1	22.8	4.4	6.6	6.6	100.0
4	FL	PENSACOLA	55.1	11.1	1.0	5.5	6.6	100.0
4	FL	ST. PETERSBURG	44.1	22.8	4.4	6.6	6.6	100.0
4	FL	TALLAHASSEE	44.1	22.8	4.4	6.6	6.6	100.0
4	FL	TAMPA	44.1	22.8	4.4	6.6	6.6	100.0
4	FL	WEST PALM BEACH	44.1	22.8	4.4	6.6	6.6	100.0
4	FL	OTHER URBAN AREAS	50.0	29.2	4.3	7.4	9.1	100.0
4	FL	AVE. FOR STATE	50.0	29.2	4.3	7.4	9.1	100.0
4	GA	ATLANTA	43.2	33.3	4.4	7.7	10.0	100.0
4	GA	AUGUSTA	48.5	28.9	4.4	7.7	9.9	100.0
4	GA	COLUMBUS	49.2	28.9	4.4	7.7	9.9	100.0
4	GA	MACON	41.3	22.8	4.4	7.7	8.8	100.0
4	GA	SAVANNAH	40.5	22.8	4.4	7.7	8.8	100.0
4	GA	OTHER URBAN AREAS	40.5	22.8	4.4	7.7	8.8	100.0
4	GA	AVE. FOR STATE	50.5	22.9	4.3	7.3	9.0	100.0
4	KY	HUNTINGTON METRO	53.1	27.4	4.4	7.7	8.8	100.0
4	KY	LEXINGTON	44.6	34.3	4.4	6.6	6.6	100.0
4	KY	LOUISVILLE	49.3	24.3	4.4	6.6	6.6	100.0
4	KY	OWENSBORO	40.9	34.3	4.4	6.6	6.6	100.0
4	KY	OTHER URBAN AREAS	49.2	34.3	4.4	6.6	6.6	100.0
4	KY	AVE. FOR STATE	49.2	34.3	4.4	6.6	6.6	100.0
4	MS	BILOXI	40.5	22.8	4.4	7.7	8.8	100.0
4	MS	JACKSON	49.6	22.8	4.4	7.7	8.8	100.0
4	MS	OTHER URBAN AREAS	44.7	22.8	4.4	7.7	8.8	100.0
4	MS	AVE. FOR STATE	54.7	26.4	3.9	6.7	8.2	100.0
4	NC	ASHEVILLE	60.5	22.8	4.4	7.7	8.8	100.0
4	NC	CHARLOTTE	49.6	27.4	4.4	7.7	8.8	100.0
4	NC	DURHAM	43.6	27.4	4.4	7.7	8.8	100.0
4	NC	FAYETTEVILLE	55.7	22.8	4.4	7.7	8.8	100.0
4	NC	GREENSBORO	61.6	22.8	4.4	7.7	8.8	100.0
4	NC	HIGHPOINT	61.9	22.8	4.4	7.7	8.8	100.0
4	NC	RALFPH	56.6	22.8	4.4	7.7	8.8	100.0
4	NC	WILMINGTON	58.8	22.8	4.4	7.7	8.8	100.0
4	NC	WINSTON-SALEM	56.6	22.8	4.4	7.7	8.8	100.0
4	NC	OTHER URBAN AREAS	55.2	26.2	3.9	6.6	8.2	100.0
4	NC	AVE. FOR STATE	55.2	26.2	3.9	6.6	8.2	100.0
4	SC	CHARLESTON	54.2	26.7	4.4	6.6	8.3	100.0
4	SC	COLUMBIA	53.6	27.1	4.4	6.6	8.3	100.0
4	SC	GREENVILLE	55.6	25.9	4.4	6.6	8.3	100.0
4	SC	OTHER URBAN AREAS	44.3	26.7	4.4	6.6	8.3	100.0
4	SC	AVE. FOR STATE	54.3	26.7	3.9	6.6	8.3	100.0
4	TN	CHATTANOOGA	60.1	23.3	4.4	5.9	7.3	100.0
4	TN	KNOXVILLE	55.9	27.9	4.4	6.6	8.1	100.0
4	TN	MEMPHIS	40.7	34.7	4.4	6.6	6.6	100.0
4	TN	NASHVILLE	70.8	17.1	4.4	4.4	5.3	100.0
4	TN	OTHER URBAN AREAS	59.4	23.7	3.5	6.0	7.4	100.0
4	TN	AVE. FOR STATE	59.4	23.7	3.5	6.0	7.4	100.0
4		AVE. FOR REGION 4	53.6	27.1	4.0	6.9	8.4	100.0

TABLE III-4 LAND USE DISTRIBUTION FOR THE URBAN AREAS IN THE U.S.

EPA RFG	STATE ID	URBANIZED AREA	LAND USE AS % OF TOTAL AREA					
			INDV	RES	COMM	INDL	OTH	TOTAL
U	IL	AURORA	44.8	33.3	14.4	6.5	1.0	100.0
		BLOOMINGTON	40.0	33.5	15.2	6.6	1.0	100.0
		CHAMPAIGN	33.1	45.5	11.2	7.2	1.0	100.0
		CHICAGO	33.1	46.3	11.2	7.2	1.0	100.0
		DAVENPORT METRO	48.1	33.3	11.2	6.4	1.0	100.0
		DECATUR	48.1	33.3	11.2	6.4	1.0	100.0
		JOLIET	48.1	33.3	11.2	6.4	1.0	100.0
		PEORIA	48.1	33.3	11.2	6.4	1.0	100.0
		ROCKFORD	48.1	33.3	11.2	6.4	1.0	100.0
		SPRINGFIELD	48.1	33.3	11.2	6.4	1.0	100.0
		OTHER URBAN AREAS	28.7	41.6	6.1	10.5	13.0	100.0
U	IL	AVE. FOR STATE	28.7	41.6	6.1	10.5	13.0	100.0
U	IN	ANDERSON	27.3	43.4	6.2	12.2	10.9	100.0
		CHICAGO METRO	41.8	33.3	11.2	9.7	10.0	100.0
		EVANSVILLE	42.2	33.3	11.2	9.7	10.0	100.0
		FORT WAYNE	42.2	33.3	11.2	9.7	10.0	100.0
		INDIANAPOLIS	42.2	33.3	11.2	9.7	10.0	100.0
		LAFAYETTE	42.2	33.3	11.2	9.7	10.0	100.0
		MUNCIE	42.2	33.3	11.2	9.7	10.0	100.0
		SOUTH BEND	47.6	33.3	11.2	9.7	10.0	100.0
		TERRA HAUTE	47.6	33.3	11.2	9.7	10.0	100.0
		OTHER URBAN AREAS	47.1	30.9	4.6	7.3	9.6	100.0
		U	IN	AVE. FOR STATE	47.1	30.9	4.6	7.3
U	MI	ANN ARBOR	44.8	33.3	14.4	6.5	1.0	100.0
		BAY CITY	44.8	33.3	14.4	6.5	1.0	100.0
		DETROIT	29.9	41.6	6.1	10.5	13.0	100.0
		FLINT	40.0	33.3	11.2	6.6	1.0	100.0
		GRAND RAPIDS	42.2	33.3	11.2	6.4	1.0	100.0
		JACKSON	42.2	33.3	11.2	6.4	1.0	100.0
		KALAMAZOO	42.2	33.3	11.2	6.4	1.0	100.0
		LANSING	42.2	33.3	11.2	6.4	1.0	100.0
		MUSKEGON	42.2	33.3	11.2	6.4	1.0	100.0
		SAGINAW	42.2	33.3	11.2	6.4	1.0	100.0
		OTHER URBAN AREAS	37.3	36.6	5.5	9.3	11.4	100.0
U	MI	AVE. FOR STATE	37.3	36.6	5.5	9.3	11.4	100.0
U	MN	DULUTH	47.6	33.3	11.2	6.4	1.0	100.0
		FARGO METRO	38.8	33.3	11.2	6.4	1.0	100.0
		MINNEAPOLIS	53.4	33.3	11.2	6.4	1.0	100.0
		ROCHESTER	36.4	33.3	11.2	6.4	1.0	100.0
		OTHER URBAN AREAS	54.1	33.3	11.2	6.4	1.0	100.0
U	MN	AVE. FOR STATE	54.1	33.3	11.2	6.4	1.0	100.0
U	OH	AKRON	49.1	33.3	11.2	6.4	1.0	100.0
		CANTON	43.0	33.3	11.2	6.4	1.0	100.0
		CINCINNATI	41.1	33.3	11.2	6.4	1.0	100.0
		CLEVELAND	44.0	33.3	11.2	6.4	1.0	100.0
		COLUMBUS	40.9	33.3	11.2	6.4	1.0	100.0
		DAYTON	44.0	33.3	11.2	6.4	1.0	100.0
		HAMILTON	42.2	33.3	11.2	6.4	1.0	100.0
		LIMA	41.1	33.3	11.2	6.4	1.0	100.0
		LORAIN	40.0	33.3	11.2	6.4	1.0	100.0
		MANSFIELD	40.0	33.3	11.2	6.4	1.0	100.0
		SPRINGFIELD	40.0	33.3	11.2	6.4	1.0	100.0
		STEUBENVILLE	37.6	33.3	11.2	6.4	1.0	100.0
		TOLLEDO	45.5	33.3	11.2	6.4	1.0	100.0
		YOUNGSTOWN	44.8	33.3	11.2	6.4	1.0	100.0
		OTHER URBAN AREAS	45.3	32.0	4.7	8.1	10.0	100.0
U	OH	AVE. FOR STATE	45.3	32.0	4.7	8.1	10.0	100.0
U	WI	APPLETON	40.0	33.3	11.2	6.4	1.0	100.0
		DULUTH METRO	40.0	33.3	11.2	6.4	1.0	100.0
		GREEN BAY	40.0	33.3	11.2	6.4	1.0	100.0
		KENOSHA	40.0	33.3	11.2	6.4	1.0	100.0
		LA CROSSE	40.0	33.3	11.2	6.4	1.0	100.0
		MADISON	40.0	33.3	11.2	6.4	1.0	100.0
		MILWAUKEE	40.0	33.3	11.2	6.4	1.0	100.0
		OSHKOSH	40.0	33.3	11.2	6.4	1.0	100.0
		RACINE	40.0	33.3	11.2	6.4	1.0	100.0
		OTHER URBAN AREAS	40.0	33.3	11.2	6.4	1.0	100.0
		U	WI	AVE. FOR STATE	40.0	33.3	11.2	6.4
U		AVE. FOR REGION 5	42.4	33.6	5.0	8.5	10.5	100.0

TABLE III-4 LAND USE DISTRIBUTION FOR THE URBAN AREAS IN THE U.S.

EPA RFG	STATE ID	URBANIZED AREA	LAND USE AS % OF TOTAL AREA					TOTAL
			INDV	RFS	COMM	INDL	OTH	
6	AR	FORT SMITH	71.4	16.7	2.5	4.2	5.2	100.0
6	AR	LITTLE ROCK	53.6	27.1	4.0	6.9	8.4	100.0
6	AR	PINE BLUFF	46.2	31.4	4.6	8.0	9.8	100.0
6	AR	OTHER URBAN AREAS	58.8	24.1	3.5	6.1	7.5	100.0
6	AR	AVE. FOR STATE	58.8	24.1	3.5	6.1	7.5	100.0
6	LA	BATON ROUGE	45.9	31.6	4.7	8.0	9.8	100.0
6	LA	LAFAYETTE	43.7	32.9	4.8	8.3	10.3	100.0
6	LA	LAKE CHARLES	50.3	29.0	4.3	7.4	9.0	100.0
6	LA	MONROE	55.0	26.3	3.9	6.7	8.2	100.0
6	LA	NEW ORLEANS	4.8	55.6	8.2	14.1	17.3	100.0
6	LA	SHREVEPORT	51.6	28.3	4.2	7.2	8.8	100.0
6	LA	OTHER URBAN AREAS	39.1	35.6	5.2	9.0	11.1	100.0
6	LA	AVE. FOR STATE	39.1	35.6	5.2	9.0	11.1	100.0
6	NM	ALBUQUERQUE	50.1	29.2	4.3	7.4	9.1	100.0
6	NM	OTHER URBAN AREAS	50.1	29.2	4.3	7.4	9.1	100.0
6	NM	AVE. FOR STATE	50.1	29.2	4.3	7.4	9.1	100.0
6	OK	LAWTON	56.0	25.7	3.8	6.5	8.0	100.0
6	OK	OKLAHOMA CITY	63.5	21.3	3.1	5.4	6.6	100.0
6	OK	TULSA	57.8	24.6	3.6	6.2	7.7	100.0
6	OK	OTHER URBAN AREAS	61.1	22.7	3.3	5.8	7.1	100.0
6	OK	AVE. FOR STATE	61.1	22.7	3.3	5.8	7.1	100.0
6	TX	ARILENE	73.6	15.4	2.3	3.9	4.8	100.0
6	TX	AMARILLO	57.5	24.8	3.7	6.3	7.7	100.0
6	TX	AUSTIN	64.2	22.6	4.8	8.3	10.1	100.0
6	TX	BEAUMONT	66.3	19.7	5.9	5.0	6.1	100.0
6	TX	BROWNSVILLE	39.1	35.6	5.2	9.0	11.1	100.0
6	TX	BRYAN	66.3	19.7	5.9	5.0	6.1	100.0
6	TX	CORPUS CHRISTI	55.4	21.0	3.0	5.2	6.4	100.0
6	TX	DALLAS	59.0	23.9	3.5	6.6	7.5	100.0
6	TX	EL PASO	47.1	30.9	3.5	5.1	6.1	100.0
6	TX	FORT WORTH	63.5	21.3	3.1	5.4	6.6	100.0
6	TX	GALVESTON	48.9	29.9	4.4	6.8	7.9	100.0
6	TX	HARLINGEN	47.7	29.9	4.4	6.8	7.9	100.0
6	TX	HOUSTON	43.7	32.9	4.8	8.3	10.3	100.0
6	TX	LARFDO	42.9	33.3	4.9	8.4	10.4	100.0
6	TX	LURBROCK	59.6	23.6	3.5	6.5	7.4	100.0
6	TX	MCALLEN	48.1	30.3	4.5	7.7	9.5	100.0
6	TX	MIDLAND	60.8	22.9	3.4	5.4	7.1	100.0
6	TX	ODESSA	41.8	34.0	3.0	6.1	10.6	100.0
6	TX	PORT ARTHUR	65.6	20.1	3.3	5.5	6.3	100.0
6	TX	SAN ANGELO	60.7	23.1	3.4	5.8	7.2	100.0
6	TX	SAN ANTONIO	39.9	35.1	5.2	9.9	10.9	100.0
6	TX	SHERMAN	65.9	19.9	3.9	5.5	6.2	100.0
6	TX	TEXARKANA	60.8	22.9	3.4	5.4	7.1	100.0
6	TX	TEXAS CITY	76.4	13.8	2.0	3.5	4.3	100.0
6	TX	TYLER	52.9	27.5	4.1	7.4	8.6	100.0
6	TX	WACO	70.4	17.3	2.5	4.4	5.4	100.0
6	TX	WICHLITA FALL	53.8	27.0	4.0	6.8	8.4	100.0
6	TX	OTHER URBAN AREAS	56.0	25.7	3.8	6.5	8.0	100.0
6	TX	AVE. FOR STATE	56.0	25.7	3.8	6.5	8.0	100.0
6		AVE. FOR REGION 6	55.3	26.1	3.8	6.6	8.1	100.0

TABLE III-4 LAND USE DISTRIBUTION FOR THE URBAN AREAS IN THE U.S.

EPA REG	STATE ID	URBANIZED AREA	LAND USE AS % OF TOTAL AREA					
			INDV	RES	COMM	INDL	OTH	TOTAL
7	IA	CEDAR RAPIDS	56.8	25.2	3.7	6.4	7.9	100.0
7	IA	DAVENPORT	69.4	17.9	2.6	4.5	5.6	100.0
7	IA	DES MOINES	53.7	27.0	4.0	6.8	8.4	100.0
7	IA	DUBUQUE	40.3	34.9	5.1	8.8	10.0	100.0
7	IA	STOUIX CITY	65.4	20.2	3.0	5.1	6.3	100.0
7	IA	WATERLOO	64.7	20.6	3.0	5.2	6.4	100.0
7	IA	OTHER URBAN AREAS	60.4	23.1	3.4	5.9	7.2	100.0
7	IA	AVE. FOR STATE	60.4	23.1	3.4	5.9	7.2	100.0
7	KS	KANSAS CITY METRO	42.9	33.3	4.9	2.5	10.4	100.0
7	KS	TOPEKA	51.6	22.3	4.2	7.2	8.8	100.0
7	KS	WYCHITA	46.6	31.3	4.6	7.9	9.7	100.0
7	KS	OTHER URBAN AREAS	46.6	31.3	4.6	7.9	9.8	100.0
7	KS	AVE. FOR STATE	46.4	31.3	4.6	7.9	9.8	100.0
7	MO	COLUMBIA	68.9	18.2	2.7	4.6	5.7	100.0
7	MO	KANSAS CITY	58.3	28.4	3.6	5.2	7.6	100.0
7	MO	SPRINGFIELD	60.0	23.3	3.4	5.9	7.3	100.0
7	MO	ST. JOSEPH	39.7	41.1	6.0	9.2	12.8	100.0
7	MO	ST. LOUIS	33.8	38.7	5.7	8.4	12.1	100.0
7	MO	OTHER URBAN AREAS	46.7	31.1	4.6	7.9	9.7	100.0
7	MO	AVE. FOR STATE	46.7	31.1	4.6	7.9	9.7	100.0
7	NE	LYNCOLN	45.8	31.7	4.7	2.0	9.9	100.0
7	NE	OMAHA	42.1	33.2	5.0	8.6	10.5	100.0
7	NE	OTHER URBAN AREAS	43.0	32.3	4.9	2.4	10.4	100.0
7	NE	AVE. FOR STATE	43.0	32.3	4.9	2.4	10.4	100.0
7		AVE. FOR REGION 7	50.4	22.9	4.3	7.3	9.0	100.0
8	CO	BOULDER	27.0	42.6	6.3	3.3	10.3	100.0
8	CO	COLORADO SPRINGS	54.6	26.5	5.2	3.9	8.5	100.0
8	CO	DENVER	38.7	33.2	5.3	7.7	11.2	100.0
8	CO	PUEBLO	42.5	33.6	4.9	5.1	10.0	100.0
8	CO	OTHER URBAN AREAS	41.9	33.9	5.0	2.6	10.0	100.0
8	CO	AVE. FOR STATE	41.9	33.9	5.0	2.6	10.6	100.0
8	MT	BILLINGS	49.7	29.4	4.3	7.4	9.1	100.0
8	MT	GREAT FALLS	42.4	33.6	5.0	8.5	10.0	100.0
8	MT	OTHER URBAN AREAS	46.5	31.3	4.6	7.9	9.7	100.0
8	MT	AVE. FOR STATE	46.5	31.3	4.6	7.9	9.7	100.0
8	ND	FARGO	39.2	35.5	5.2	9.0	11.1	100.0
8	ND	OTHER URBAN AREAS	39.2	35.5	5.2	9.0	11.1	100.0
8	ND	AVE. FOR STATE	39.2	35.5	5.2	9.0	11.1	100.0
8	SD	STOUIX FALLS	47.8	30.5	4.5	7.7	9.5	100.0
8	SD	OTHER URBAN AREAS	47.8	30.5	4.5	7.7	9.5	100.0
8	SD	AVE. FOR STATE	47.8	30.5	4.5	7.7	9.5	100.0
8	UT	ORDEN	52.0	22.0	4.1	7.1	8.7	100.0
8	UT	PROVO	65.4	20.2	3.0	5.1	6.3	100.0
8	UT	SALT LAKE CITY	50.1	29.2	4.3	7.4	9.1	100.0
8	UT	OTHER URBAN AREAS	53.7	27.1	4.0	6.9	8.4	100.0
8	UT	AVE. FOR STATE	53.7	27.1	4.0	6.9	8.4	100.0
8	WY	URBAN AREAS	50.0	29.2	4.3	7.4	9.1	100.0
8	WY	AVE. FOR STATE	50.0	29.2	4.3	7.4	9.1	100.0
8		AVE. FOR REGION 8	46.5	31.2	4.6	7.9	9.7	100.0

TABLE III-4 LAND USE DISTRIBUTION FOR THE URBAN AREAS IN THE U.S.								
EPA RFG	STATE ID	URBANIZED AREA	LAND USE AS % OF TOTAL AREA				TOTAL	
			INDV	RES	COMM	INDL		OTH
9	AK	URBAN AREAS	60.1	23.3	3.4	5.9	7.3	100.0
9	AK	AVE. FOR STATE	60.1	23.3	3.4	5.9	7.3	100.0
9	AZ	PHOENIX	55.4	26.1	3.8	6.6	8.1	100.0
9	AZ	TUCSON	47.5	30.6	4.5	7.8	9.5	100.0
9	AZ	OTHER URBAN AREAS	53.7	27.0	4.0	6.9	8.4	100.0
9	AZ	AVE. FOR STATE	53.7	27.0	4.0	6.9	8.4	100.0
9	CA	BAKERSFIELD	44.0	32.7	4.8	8.3	10.2	100.0
9	CA	FRESNO	41.3	34.3	5.0	8.7	10.7	100.0
9	CA	LOS ANGELES	24.4	44.2	6.5	11.3	13.3	100.0
9	CA	MODESTO	43.7	32.6	4.8	8.2	10.2	100.0
9	CA	OXNARD	55.9	25.7	3.8	6.5	8.0	100.0
9	CA	SACRAMENTO	50.1	25.1	3.3	7.4	9.0	100.0
9	CA	SALTINAS	33.4	38.0	7.7	9.9	11.1	100.0
9	CA	SAN BERNARDINO	40.6	33.0	5.5	8.4	10.5	100.0
9	CA	SAN DIEGO	43.4	33.1	4.9	8.4	10.3	100.0
9	CA	SAN FRANCISCO	31.2	43.2	5.9	10.2	12.4	100.0
9	CA	SAN JOSE	37.4	33.5	5.5	9.9	11.1	100.0
9	CA	SANTA BARRARA	39.3	35.4	5.5	9.0	10.0	100.0
9	CA	SANTA ROSA	59.2	23.8	5.5	6.0	7.4	100.0
9	CA	SFASIDE	35.7	37.5	5.5	6.5	7.7	100.0
9	CA	STMT VALLEY	54.6	26.5	5.9	7.7	8.3	100.0
9	CA	STOCKTON	40.5	34.8	5.1	8.8	10.6	100.0
9	CA	OTHER URBAN AREAS	35.4	37.7	5.6	9.6	11.8	100.0
9	CA	AVE. FOR STATE	35.4	37.7	5.6	9.6	11.8	100.0
9	HI	HONOLULU	36.0	37.4	5.5	9.5	11.6	100.0
9	HI	OTHER URBAN AREAS	36.0	37.4	5.5	9.5	11.6	100.0
9	HI	AVE. FOR STATE	36.0	37.4	5.5	9.5	11.6	100.0
9	NV	LAS VEGAS	59.4	23.7	3.5	6.0	7.4	100.0
9	NV	RENO	49.7	29.4	4.3	7.4	9.2	100.0
9	NV	OTHER URBAN AREAS	57.1	25.0	3.7	6.3	7.8	100.0
9	NV	AVE. FOR STATE	57.1	25.0	3.7	6.3	7.8	100.0
9		AVE. FOR REGION 9	38.6	35.9	5.3	9.1	11.2	100.0
10	ID	BOISE	45.9	31.6	4.7	8.0	9.8	100.0
10	ID	OTHER URBAN AREAS	45.9	31.6	4.7	8.0	9.8	100.0
10	ID	AVE. FOR STATE	45.9	31.6	4.7	8.0	9.8	100.0
10	OR	EUGENE	51.1	28.6	4.2	7.2	8.9	100.0
10	OR	PORTLAND	44.0	32.7	4.8	8.3	10.2	100.0
10	OR	SALEM	51.3	28.4	4.2	7.2	8.9	100.0
10	OR	OTHER URBAN AREAS	45.8	31.6	4.7	8.0	9.9	100.0
10	OR	AVE. FOR STATE	45.8	31.6	4.7	8.0	9.9	100.0
10	WA	SEATTLE	45.1	32.1	4.7	8.1	10.0	100.0
10	WA	SPOKANE	45.7	31.7	4.7	8.0	9.9	100.0
10	WA	TACOMA	50.5	28.9	4.3	7.3	9.0	100.0
10	WA	OTHER URBAN AREAS	46.3	31.4	4.6	7.9	9.8	100.0
10	WA	AVE. FOR STATE	46.3	31.4	4.6	7.9	9.8	100.0
10		AVE. FOR REGION 10	46.1	31.5	4.6	8.0	9.8	100.0
		AVERAGE FOR THE U.S.	46.2	31.4	4.6	8.0	9.8	100.0

## POPULATION AND AREA SERVED BY TYPE OF SEWER SYSTEM

### Combined Sewers

Two data sources were used to determine the estimated population served by combined sewers for the 50 metropolitan areas studied in detail. Population and area estimates were taken from a 1968 Inventory of Municipal Waste Facilities, done by USEPA.<sup>4</sup> The inventory lists contributory population to each treatment facility and identifies those facilities served in whole or in part by combined sewers.

The second source of data was a 1967 inventory conducted by the APWA for USEPA of local authorities with combined sewer systems.<sup>5</sup> For that survey, personal interviews were conducted at over 640 authorities which were selected. Where large variations were evident, the local City Engineer was asked to verify the population estimate. In all cases, the population thus obtained was approximately the same as the APWA estimate - indicating that the 1968 inventory figures were for the total contributory to the facility.

The population estimate which was used consisted of the APWA survey for each city with data and the total population given by the 1968 inventory for cities not surveyed by APWA with a population less than 25,000. Thus, the total used may be somewhat larger than the actual.

Area served by combined sewers was projected at the same population density as for the core cities for which data were available. This would underestimate the total area if the correct population estimate was available, but is compensated for by the overpopulation estimate. If the calculated population density for the combined sewer areas was less than the storm sewer population density, then the two densities were equated by adjusting the area served by combined sewers.

The above results permit determination of the proportion of the urban area served by combined sewers. These results are extrapolated to the state level by assuming that the population and area served by combined sewers is the same for the rest of the state.

### Separately Sewered and Unsewered Areas

Information was obtained regarding the population density distributions of the fifty cities.<sup>6</sup> Using these data, the census tracts were ranked by population density and grouped into five categories ranging from lowest density to highest density. A histogram for the City of Albany, New York, is shown in Figure III-4, Population Density Distribution of Albany, New York.

An equation of the form

$$PD = ax^b \quad (III-3)$$

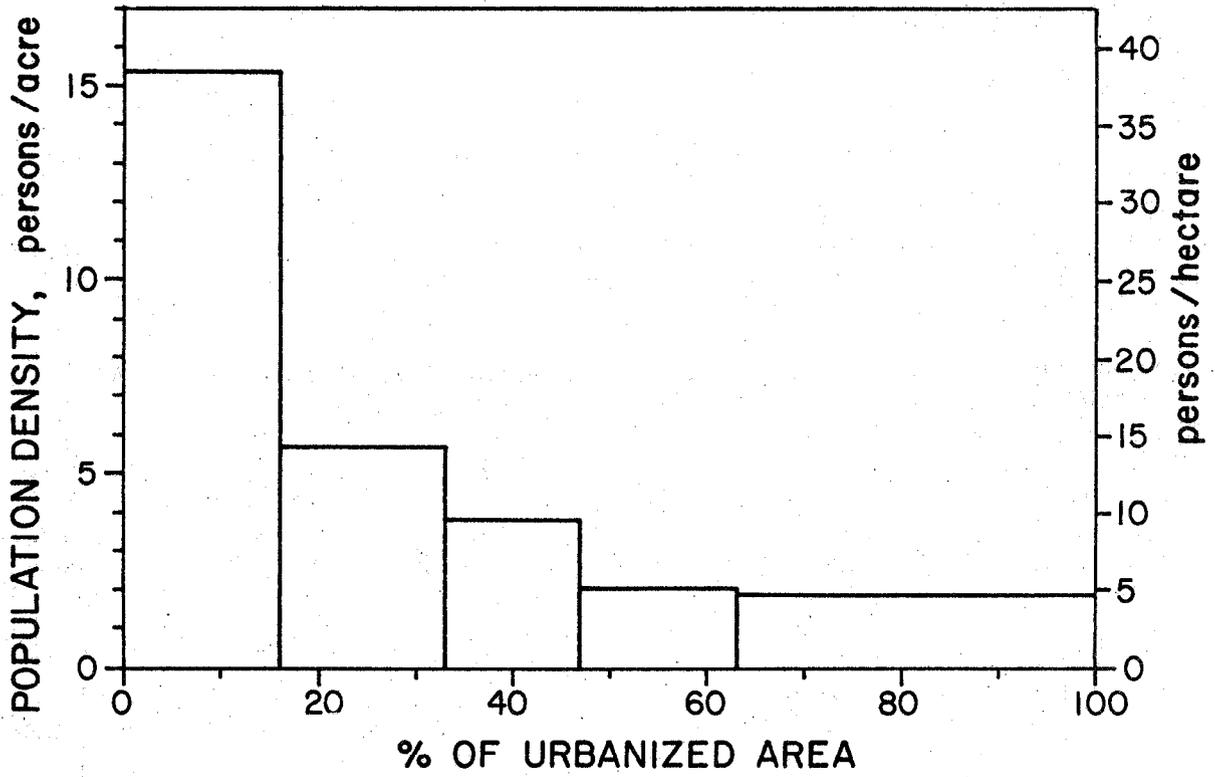


Figure III-4. Population Density Distribution of Albany, New York

where PD = gross population density, persons per acre  
(PD  $\geq$  0),

x = percent of urbanized area ( $0 \leq x \leq 100$ ), and

a, b = parameters,

was fit to these data. The average population density in any interval,  $x_1$  to  $x_2$ , is

$$PD_{x_1-x_2} = \frac{1}{x_2-x_1} \int_{x_1}^{x_2} ax^b dx. \quad (\text{III-4})$$

To calibrate the overall average population density with the calculated population density, an approximate value of  $x_1$  was found such that  $PD_{x_1-100} = PD_{\text{calc}}$ . For example, for Albany,

$$PD = 108 x^{-0.933} \quad (\text{III-5})$$

and the actual average population density is 5.03 persons per acre (12.4 persons per ha). Thus,

$$5.03 = \frac{1}{100-x_1} \int_{x_1}^{100} 108 x^{-0.933} dx. \quad (\text{III-6})$$

This equation is solved to find  $x_1$ . To calibrate the overall average population density with the calculated population density, for the other 198 cities, values of b were assigned based on their similarity to the five test cities. A value of  $x_1 = 2$  was used to avoid instability problems. Then, a was calculated such that the average population density,  $PD_{2-100}$ , is

$$PD_{2-100} = \frac{1}{100-2} \int_2^{100} ax^b dx, \quad (\text{III-7})$$

or

$$a = \frac{98 PD(1+b)}{100(1+b) - 2(1+b)}. \quad (\text{III-8})$$

Thus, the final equation for gross population density is

$$PD = ax^b \text{ with } x_1 \leq x \leq 100. \quad (\text{III-9})$$

Given the equation in the form  $PD = ax^b$ , one can find the average population density, the proportion of the population within certain densities and so forth.

The method for determining which of the 50 cities would be selected for the city in question was as follows. All 50 cities were divided into their respective USEPA regions. The mean and standard deviation of the population, land area, and population density were determined. Then a range of acceptable values was found for these parameters within each USEPA region.

For each city in question, two approaches were used in selecting the appropriate reference test city. First, all test cities in the same USEPA region as the city in question that fell within the described range were listed. Second, those test cities outside the respective USEPA region that fell within 10 percent of the mean values for the parameters of the city in question were listed. The order of priority in selecting the reference test city was as follows:

1. proximity of population density and land area in same USEPA region; and
2. proximity of population density and land area outside USEPA region.

In selecting the "best" reference test city, location and land area were the dominant factors because they have a definite influence on population density. Similar location implies that the city in question would probably have developed at the same time and have been influenced by similar national population shifts, manufacturing technologies, urban growth patterns, etc. Land area was chosen simply because population density is a function of the size of the urbanized area. For the above reasons, the majority of the cities in question were referenced to a test city outside their respective USEPA region.

The population density function,  $PD = ax^b$ , is given in terms of the total urbanized area. Thus, it needs to be modified to integrate over only the developed portion of the urban area as shown in Figure III-5, Characterization of Population Density in Urban Areas. In order for the area under the two curves to be equal, one must have that

$$\int_{x_1}^{100} ax^b dx = \int_{x_1}^{100(1-Z)} a'x^b dx \quad (\text{III-10})$$

or

$$a' = a[100^{(1+b)} - x_1^{(1+b)}] / [(100(1-Z))^{(1+b)} - x_1^{(1+b)}]. \quad (\text{III-11})$$

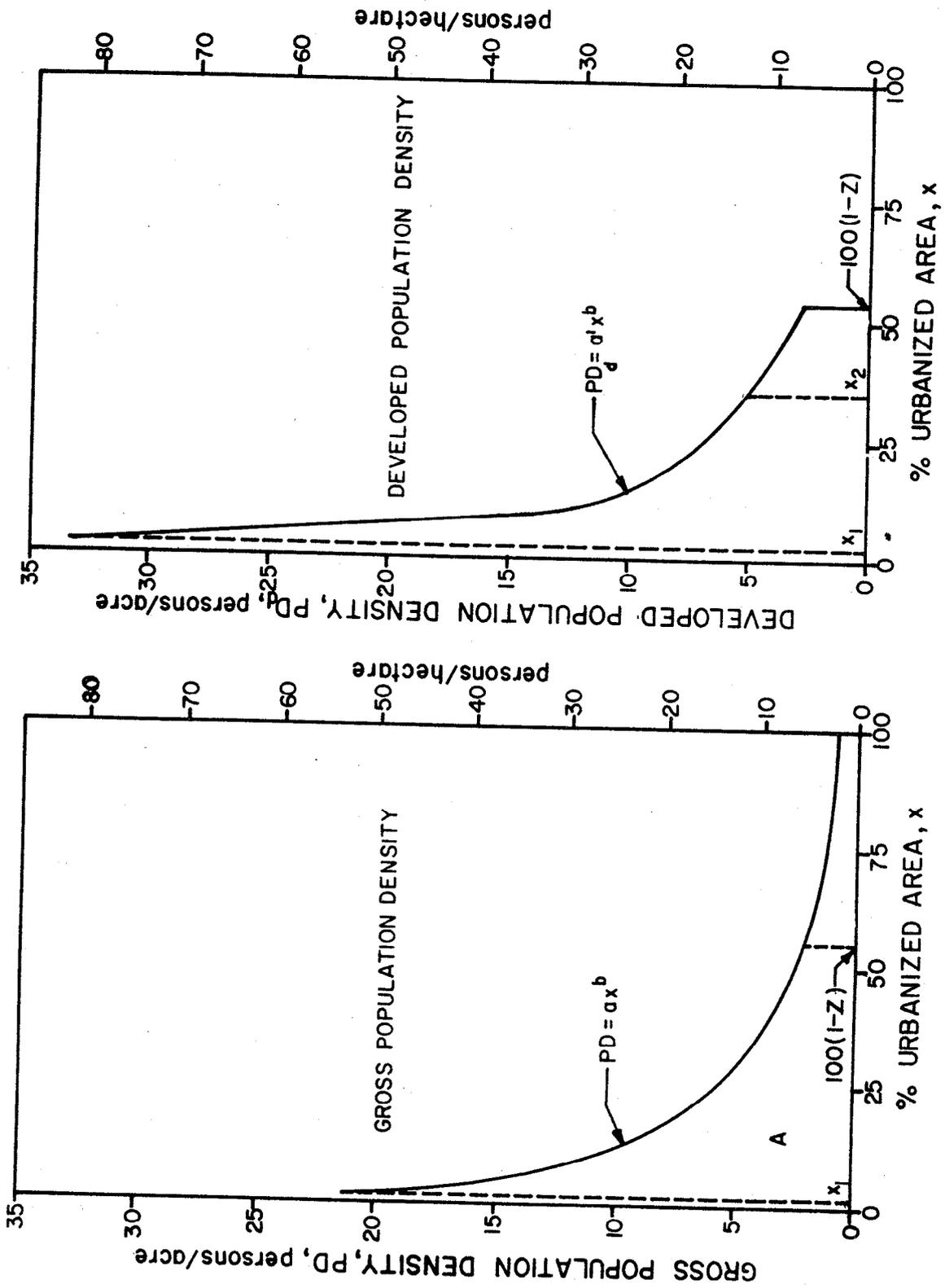


Figure III-5. Characterization of Population Density in Urban Areas

Then,

$$PD_d = a'x_1^b \quad (III-12)$$

where  $PD_d$  = population density in developed portion of the urban area,

$a'$  = adjusted coefficient from equation III-11, and

$x_1$  = calibrated lower limit on percent urbanized area.

The percent of the urban area which is sewered is known for the nine Ontario cities. Computing the corresponding  $PD_d$  for seven of the cities resulted in the values shown in Table III-5, Minimum Population Density for Sewered Portion of Seven Urbanized Areas in Ontario. Guelph and West Toronto were considered extreme values and not entered into Table III-5. Based on these data, a cutoff minimum developed population density of five persons per acre (12.4 persons per ha) was used to delineate the sewered part of the urban area. Solving equation III-12 for  $x_2$  yields

$$x_2 = \min [(5/a)^{1/b}, 100(1-Z)] \quad (III-13)$$

where  $x_2$  = percent of the urban area which is sewered.

Knowing the percent of the urbanized area which is undeveloped, i.e.,  $100Z$ , the combined sewered area from the survey data and the percent of the urban area which is sewered,  $x_2$ , then the other sewered and unsewered developed areas can be calculated as residuals. The calculation procedure is summarized below:

#### Sewered Areas as a Percentage of Total Urbanized Area

1. Undeveloped Area =  $100(Z) = x_u$
2. Sewered Area =  $x_2$
3. Combined Sewer Area =  $x_c$ , from APWA data
4. Storm Sewer Area =  $x_2 - x_c$
5. Unsewered Developed Area =  $100 - x_u - x_2$

Table III-5. MINIMUM POPULATION DENSITY FOR SEWERED PORTION OF SEVEN URBANIZED AREAS IN ONTARIO<sup>2</sup>

City	Minimum Sewered Population Density, PD <sub>d</sub>	
	(persons/acre)	(persons/ha)
Burlington	3.93	9.7
Kingston	7.28	18.0
Kitchener	4.49	11.1
St. Catharines	5.79	14.3
Sault Ste. Marie	4.67	11.5
Thunder Bay	6.12	15.1
Windsor	3.87	9.6
Average of 7 cities	5.16	12.8

The results of these calculations are shown in Table III-6, Land Use by Type of Sewerage System.

The population served by combined sewerage systems is estimated directly from the APWA data. Combined sewers are found in the older and typically more densely populated portions of the urbanized areas. This fact suggests that a good approximation of the population would be obtained by assuming that the higher density areas are combined. The next highest density is served by storm sewers and the lowest densities are unsewered. Thus, the population served by type of sewer system is calculated as shown below:

Population Served by Type of Sewerage System

1. Combined Sewers (P<sub>c</sub>):

$$P_c = \text{APWA estimate}$$

TABLE III-6		LAND USE BY TYPE OF SEWERAGE SYSTEM					
EPA REG	STATE ID	URBANIZED AREA	AREA SERVED BY TYPE OF SYSTEM				TOTAL
			UNDV	COMB	STORM	UNSEW	
		1000 ACRES					
1	CT	BRIDGEPORT	45.7	5.8	17.3	26.6	95.4
1	CT	BRISTOL	14.1	0.0	3.7	5.9	23.7
1	CT	DANBURY	25.5	0.0	3.5	6.2	35.2
1	CT	HARTFORD	32.7	20.8	1.1	24.3	88.9
1	CT	MERYDEN	31.5	0.0	5.1	3.6	40.2
1	CT	NEW BRITAIN	10.2	0.0	8.6	6.1	25.0
1	CT	NEW HAVEN	28.9	14.9	4.4	18.3	66.5
1	CT	NORWALK	13.7	1.5	2.2	3.5	19.9
1	CT	STAMFORD	23.2	0.0	10.8	12.3	46.3
1	CT	WATERBURY	19.2	1.8	6.8	10.6	38.4
1	CT	OTHER URBAN AREAS	35.9	6.6	10.6	18.7	71.8
1	CT	TOTAL FOR STATE	279.4	51.4	82.7	145.4	558.9
1	ME	LEWISTON	33.8	4.7	0.0	5.1	43.6
1	ME	PORTLAND	71.7	10.3	0.0	1.9	83.9
1	ME	OTHER URBAN AREAS	108.9	29.4	0.0	17.6	155.9
1	ME	TOTAL FOR STATE	164.4	44.4	0.0	26.6	235.4
1	MA	BOSTON	147.1	21.2	113.7	142.9	424.9
1	MA	BROCKTON	16.1	0.0	8.4	9.9	34.4
1	MA	FALL RIVER	11.7	7.0	0.0	7.9	26.6
1	MA	FITCHBURG	27.8	17.7	0.0	11.1	56.6
1	MA	LAWRENCE	28.6	17.0	0.0	11.1	56.7
1	MA	LOWELL	18.1	0.0	0.0	0.0	18.1
1	MA	NEW BEDFORD	7.6	0.0	0.0	4.4	12.0
1	MA	PITTSFIELD	19.3	33.9	0.0	3.8	57.0
1	MA	SPRINGFIELD	85.3	30.9	0.0	6.6	122.8
1	MA	WORCESTER	24.6	9.1	1.1	2.6	37.4
1	MA	OTHER URBAN AREAS	40.3	9.6	15.1	2.6	67.6
1	MA	TOTAL FOR STATE	426.9	101.8	160.5	276.8	966.0
1	NH	MANCHESTER	13.1	7.0	0.0	4.9	25.0
1	NH	NASHUA	13.5	4.9	0.0	3.8	22.2
1	NH	OTHER URBAN AREAS	44.5	19.9	0.0	13.8	78.2
1	NH	TOTAL FOR STATE	71.1	31.7	0.0	22.1	124.9
1	RI	PROVIDENCE	65.7	21.0	23.0	46.4	156.1
1	RI	OTHER URBAN AREAS	2.6	0.8	0.9	1.8	6.1
1	RI	TOTAL FOR STATE	68.3	21.8	23.9	48.2	162.2
1	VT	URBAN AREAS	17.1	7.9	0.0	9.6	34.6
1	VT	TOTAL FOR STATE	17.1	7.9	0.0	9.6	34.6
1		TOTAL FOR REGION 1	1027.1	259.1	267.0	523.5	2076.7
2	NJ	ATLANTIC CITY	25.2	0.0	6.8	10.9	42.9
2	NJ	NEW YORK CITY METRO	625.2	6.6	270.0	404.4	1306.2
2	NJ	PHILADELPHIA METRO	10.5	20.3	0.0	7.9	38.7
2	NJ	TRENTON	13.6	0.0	0.8	0.0	14.4
2	NJ	VINELAND	43.2	0.0	3.9	7.9	55.0
2	NJ	TOTAL FOR STATE	717.6	26.9	301.5	433.4	1479.4
2	NY	ALBANY	41.1	19.3	6.7	2.5	69.6
2	NY	BINGHAMTON	14.2	1.2	0.0	0.0	15.4
2	NY	BUFFALO	35.6	2.8	0.0	0.0	38.4
2	NY	NEW YORK CITY	100.0	100.0	132.4	30.7	333.1
2	NY	ROCHESTER	30.0	12.7	4.4	3.0	49.1
2	NY	SYRACUSE	30.0	13.7	7.7	3.0	54.4
2	NY	UTICA	15.4	2.0	0.0	0.0	17.4
2	NY	OTHER URBAN AREAS	7.7	3.8	3.9	5.0	19.4
2	NY	TOTAL FOR STATE	197.1	245.6	241.1	145.9	829.7
2		TOTAL FOR REGION 2	914.8	272.1	542.6	579.2	2308.7

TABLE III-6 LAND USE BY TYPE OF SEWERAGE SYSTEM

EPA RFG	STATE ID	URBANIZED AREA	AREA SERVED BY TYPE OF SYSTEM				TOTAL
			UNDV	COMB	STORM	UNSEW	
			1000 ACRES				
3	DE	WYLMINGTON	28.7	6.4	16.2	19.1	70.4
3	DE	OTHER URBAN AREAS	1.9	0.4	1.0	1.2	4.6
3	DE	TOTAL FOR STATE	30.6	6.8	17.2	20.3	75.0
3	DC	WASHINGTON, D.C.	1.5	12.7	25.1	0.0	39.3
3	DC	TOTAL FOR STATE	1.5	12.7	25.1	0.0	39.3
3	MD	BALTIMORE	51.2	0.0	103.0	44.2	198.4
3	MD	WASHINGTON DC METRO	27.0	0.0	27.0	22.7	76.8
3	MD	OTHER URBAN AREAS	36.3	0.0	60.4	31.0	127.6
3	MD	TOTAL FOR STATE	114.5	0.0	190.5	97.9	402.8
3	PA	ALLENTOWN	23.9	0.4	20.5	18.6	63.4
3	PA	ALTOONA	4.9	1.1	4.5	4.6	15.1
3	PA	ERIE	29.3	4.4	24.4	20.0	78.1
3	PA	HARRISBURG	22.0	4.4	12.0	1.0	39.4
3	PA	JOHNSTOWN	7.2	1.1	4.5	1.0	13.8
3	PA	LANCASTER	1.7	2.2	2.4	1.0	7.3
3	PA	PHILADELPHIA	146.3	10.9	260.0	72.6	589.8
3	PA	PITTSBURGH	167.5	31.5	40.4	12.0	351.4
3	PA	READING	8.8	0.0	12.0	4.0	24.8
3	PA	SCRANTON	36.1	17.1	20.0	14.0	87.2
3	PA	WYLMKES-BARRF	26.0	5.9	6.6	3.6	42.1
3	PA	YORK	9.8	0.0	8.6	3.6	22.0
3	PA	OTHER URBAN AREAS	56.6	10.3	49.9	39.3	156.1
3	PA	TOTAL FOR STATE	489.5	89.3	432.0	339.5	1350.4
3	VA	LYNCHBERG	13.3	1.2	13.7	0.0	28.2
3	VA	NEWPORT NEWS	5.6	0.0	0.0	0.0	5.6
3	VA	NORFOLK	105.7	0.0	33.7	22.0	161.4
3	VA	PETERSBURG	14.2	0.0	5.3	0.0	19.5
3	VA	RYCHMOND	43.3	1.0	7.3	2.7	54.3
3	VA	ROANOKE	12.5	0.0	0.0	0.0	12.5
3	VA	WASHINGTON DC METRO	12.1	0.0	0.0	1.0	13.1
3	VA	OTHER URBAN AREAS	0.1	0.0	0.1	0.0	0.2
3	VA	TOTAL FOR STATE	266.8	2.0	154.3	120.0	569.2
3	WV	CHARLESTON	20.2	6.8	1.9	10.9	41.8
3	WV	HUNTINGTON	8.4	14.8	0.0	0.0	23.2
3	WV	STEUBENVILLE METRO	10.5	6.6	0.0	0.0	17.1
3	WV	WHEELING	7.4	6.7	0.3	0.0	14.4
3	WV	OTHER URBAN AREAS	30.2	22.7	1.4	6.5	61.0
3	WV	TOTAL FOR STATE	76.7	57.6	3.5	23.7	161.6
3		TOTAL FOR REGION 3	979.6	194.5	822.6	601.4	2598.2

TABLE III-6 LAND USE BY TYPE OF SEWERAGE SYSTEM							
EPA RFG	STATE ID	URBANIZED AREA	AREA SERVED BY TYPE OF SYSTEM			UNSEW	TOTAL
			UNDV	COMB	STORM		
			1000 ACRES				
4	AL	BYRMINGHAM	74.1	0.0	30.4	39.0	144.5
4	AL	GADSDEN	25.3	0.0	3.5	9.8	35.6
4	AL	HUNTSVILLE	77.4	0.0	3.4	39.5	120.3
4	AL	MOBILE	7.1	0.0	1.7	2.3	10.7
4	AL	MONTGOMERY	15.1	0.0	7.7	9.0	32.8
4	AL	TUSCALOOSA	16.8	0.0	7.0	8.4	32.2
4	AL	OTHER URBAN AREAS	157.5	0.0	36.5	59.8	253.8
4	AL	TOTAL FOR STATE	418.8	0.0	105.1	159.1	683.0
4	FL	FT. LAUDERDALE	62.9	0.0	33.7	39.1	135.7
4	FL	GAINESVILLE	9.9	0.0	5.5	5.5	20.9
4	FL	JACKSONVILLE	150.4	0.0	39.5	45.5	235.4
4	FL	MIAMI	47.4	0.0	31.5	33.3	112.2
4	FL	ORLANDO	45.7	0.0	15.3	23.3	84.3
4	FL	PENSACOLA	21.7	0.0	9.6	11.1	42.4
4	FL	ST. PETERSBURG	45.5	0.0	26.0	31.4	103.9
4	FL	TALIAHASSEE	9.5	0.0	5.0	6.4	20.9
4	FL	TAMPA	39.7	0.0	18.0	20.6	78.3
4	FL	WEST PALM BEACH	49.4	0.0	18.5	20.6	88.5
4	FL	OTHER URBAN AREAS	155.1	0.1	75.8	79.2	310.2
4	FL	TOTAL FOR STATE	637.4	0.4	311.6	325.3	1274.7
4	GA	ALBANY	9.1	1.0	0.0	0.0	21.1
4	GA	ATLANTA	136.0	9.0	55.0	77.0	278.0
4	GA	AUGUSTA	13.2	0.0	0.0	3.3	37.5
4	GA	COLUMBUS	40.2	4.0	0.0	17.0	61.2
4	GA	MACON	16.8	0.0	7.7	9.0	32.5
4	GA	SAVANNAH	30.7	6.5	3.4	3.3	44.9
4	GA	OTHER URBAN AREAS	110.5	18.9	32.3	57.1	218.8
4	GA	TOTAL FOR STATE	352.1	60.2	102.7	181.8	696.9
4	KY	HUNTINGTON METRO	6.7	0.0	1.8	3.5	12.0
4	KY	LEXINGTON	8.8	0.0	1.4	5.4	15.6
4	KY	LOUISVILLE	50.8	0.0	38.8	41.7	131.3
4	KY	OWENSBORO	20.4	3.0	0.0	2.2	25.6
4	KY	OTHER URBAN AREAS	48.7	3.9	35.9	35.6	124.2
4	KY	TOTAL FOR STATE	119.4	9.6	88.1	87.4	304.4
4	MS	BILOXI	22.2	0.0	5.2	7.7	35.1
4	MS	JACKSON	92.9	0.0	10.7	10.3	113.9
4	MS	OTHER URBAN AREAS	103.6	0.0	35.3	50.3	189.2
4	MS	TOTAL FOR STATE	151.2	0.0	51.5	73.5	276.2
4	NC	ASHEVILLE	4.1	0.0	3.7	0.0	7.8
4	NC	CHARLOTTE	33.6	0.0	15.8	18.4	67.8
4	NC	DURHAM	14.7	0.0	8.6	2.2	25.5
4	NC	FAYETTEVILLE	6.6	0.0	4.1	2.6	13.3
4	NC	GREENSBORO	20.0	0.0	29.0	7.7	56.7
4	NC	HIGHPOINT	2.1	0.0	0.0	0.0	2.1
4	NC	RALEIGH	100.9	0.0	77.0	77.7	255.6
4	NC	WILMINGTON	30.9	0.0	27.0	4.7	62.6
4	NC	WINSTON-SALEM	30.9	0.0	27.0	7.4	65.3
4	NC	OTHER URBAN AREAS	168.8	0.0	53.5	83.7	306.0
4	NC	TOTAL FOR STATE	359.1	0.0	143.7	178.1	650.9
4	SC	CHARLESTON	34.4	0.0	11.6	17.4	63.4
4	SC	COLUMBIA	34.3	0.0	12.6	15.5	62.4
4	SC	GREENVILLE	9.5	0.0	9.9	3.3	22.7
4	SC	OTHER URBAN AREAS	4.8	0.0	3.5	4.6	12.9
4	SC	TOTAL FOR STATE	186.7	0.0	62.1	94.8	343.6
4	TN	CHATTANOOGA	45.0	2.3	8.8	18.8	74.9
4	TN	KNOXVILLE	30.0	0.0	9.4	15.0	54.4
4	TN	MEMPHIS	30.0	0.0	35.7	39.7	105.4
4	TN	NASHVILLE	130.0	14.7	11.5	33.2	198.4
4	TN	OTHER URBAN AREAS	48.5	8.7	33.4	56.7	147.3
4	TN	TOTAL FOR STATE	427.0	25.7	98.8	167.5	718.9
4		TOTAL FOR REGION 4	2651.8	95.9	933.6	1267.4	4988.6

TABLE III-6 LAND USE BY TYPE OF SEWERAGE SYSTEM		URBANIZED AREA		TYPE OF SYSTEM		
STATE	URBANIZED AREA	UNDV	COMB	STOR	UNSEW	TOTAL
STATE ID	URBANIZED AREA	1000 ACRES	1000 ACRES	1000 ACRES	1000 ACRES	1000 ACRES
IL	AURORA	1.1	0.0	0.0	0.0	1.1
	BLOOMINGTON	1.1	0.0	0.0	0.0	1.1
	CHAMPAIGN	1.1	0.0	0.0	0.0	1.1
	CHICAGO	13.6	2.0	1.1	1.7	18.4
	DAVENPORT METRO	1.1	0.0	0.0	0.0	1.1
	DECATUR	1.1	0.0	0.0	0.0	1.1
	JEFFERSON	1.1	0.0	0.0	0.0	1.1
	GEORGETOWN	1.1	0.0	0.0	0.0	1.1
	ROCKFORD	1.1	0.0	0.0	0.0	1.1
	SPRINGFIELD	1.1	0.0	0.0	0.0	1.1
OTHER URBAN AREAS	8.0	7.0	5.1	7.0	27.1	
	TOTAL FOR STATE	34.1	30.0	218.5	321.0	1189.6
IN	ANDERSON	7.5	2.0	0.0	0.0	9.5
	CHICAGO METRO	7.5	2.0	0.0	0.0	9.5
	EVANSVILLE	8.0	1.0	0.0	0.0	9.0
	FORT WAYNE	8.0	1.0	0.0	0.0	9.0
	INDIANAPOLIS	13.7	3.0	1.1	6.1	23.9
	LAFAYETTE	4.4	0.0	0.0	0.0	4.4
	MUNCIE	6.6	2.0	0.0	0.0	8.6
	SOUTH BEND	3.1	2.0	0.0	1.5	6.6
	TERRA HAUTE	1.0	0.0	0.0	0.0	1.0
	OTHER URBAN AREAS	1.0	2.0	9.0	3.1	15.1
	TOTAL FOR STATE	36.6	16.7	57.3	186.6	778.1
MI	ANN ARBOR	10.0	0.0	13.4	0.0	23.4
	BAY CITY	1.0	0.0	0.0	0.0	1.0
	DETROIT	16.0	16.0	17.0	15.0	64.0
	FLINT	2.0	0.0	0.0	0.0	2.0
	GRAND RAPIDS	2.0	0.0	0.0	0.0	2.0
	JACKSON	2.0	0.0	0.0	0.0	2.0
	KALAMAZOO	2.0	0.0	0.0	0.0	2.0
	LANSING	2.0	0.0	0.0	0.0	2.0
	MUSKEGON	2.0	0.0	0.0	0.0	2.0
	SAGINAW	2.0	0.0	0.0	0.0	2.0
OTHER URBAN AREAS	8.0	4.0	2.0	2.0	16.0	
	TOTAL FOR STATE	40.6	23.0	156.0	79.6	778.1
MN	DULUTH	3.0	0.0	0.0	0.0	3.0
	FARGO METRO	2.0	0.0	0.0	0.0	2.0
	MINNEAPOLIS	24.6	3.0	6.0	11.0	44.6
	ROCHESTER	9.3	1.0	2.0	4.0	16.3
OTHER URBAN AREAS	0.0	0.0	0.0	0.0	0.0	
	TOTAL FOR STATE	37.6	4.0	98.0	172.0	682.6
OH	AKRON	6.4	0.0	2.0	0.0	8.4
	CANTON	2.1	0.0	0.0	0.0	2.1
	CINCINNATI	13.8	7.0	11.0	14.0	45.8
	CLEVELAND	13.8	3.0	4.0	14.0	34.8
	COLUMBUS	6.1	1.0	2.0	1.0	10.1
	DAYTON	6.1	1.0	2.0	1.0	10.1
	HAMILTON	1.0	0.0	0.0	0.0	1.0
	LIMA	1.0	0.0	0.0	0.0	1.0
	LORAIN	4.0	1.0	0.0	0.0	5.0
	MANSFIELD	1.0	0.0	0.0	0.0	1.0
	SPRINGFIELD	1.0	0.0	0.0	0.0	1.0
	STUBENVILLE	1.0	0.0	0.0	0.0	1.0
	TOLLEDO	4.0	1.0	1.0	1.0	7.0
	YOUNGSTOWN	1.0	0.0	0.0	0.0	1.0
OTHER URBAN AREAS	1.0	3.0	3.0	7.0	14.0	
	TOTAL FOR STATE	77.6	21.0	237.0	489.0	1713.6
WI	APPLETON	0.0	0.0	0.0	0.0	0.0
	OMLUTH METRO	0.0	0.0	0.0	0.0	0.0
	GREEN BAY	0.0	0.0	0.0	0.0	0.0
	KENOSHA	0.0	0.0	0.0	0.0	0.0
	LA CROSSE	0.0	0.0	0.0	0.0	0.0
	MADISON	0.0	0.0	0.0	0.0	0.0
	MILWAUKEE	1.0	0.0	0.0	0.0	1.0
	OSHKOSH	0.0	0.0	0.0	0.0	0.0
	RACINE	0.0	0.0	0.0	0.0	0.0
	OTHER URBAN AREAS	0.0	0.0	0.0	0.0	0.0
	TOTAL FOR STATE	34.1	3.0	144.0	170.0	688.1
	TOTAL FOR REGION 5	2609.2	999.0	912.0	1633.0	6156.6

TABLE III-6 LAND USE BY TYPE OF SEWERAGE SYSTEM

EPA RFG	STATE ID	URBANIZED AREA	AREA SERVED BY TYPE OF SYSTEM			
			UNDV	COMB	STORM	UNSEW
6	AR	FORT SMITH	27.4	0.3	0.0	0.6
6	AR	LITTLE ROCK	32.6	0.0	3.7	20.6
6	AR	PTNE BLUFF	6.2	0.0	7.3	3.5
6	AR	OTHER URBAN AREAS	110.8	7.2	18.8	51.6
6	AR	TOTAL FOR STATE	177.0	11.6	30.1	82.4
6	LA	BATON ROUGE	25.0	0.0	14.3	15.1
6	LA	LAFAYETTE	7.0	0.0	5.1	3.9
6	LA	LAKE CHARLES	10.9	0.0	4.3	7.9
6	LA	MONROE	14.1	0.0	3.9	7.7
6	LA	NEW ORLEANS	22.6	0.0	5.2	5.0
6	LA	SHREVEPORT	31.1	0.0	12.6	20.0
6	LA	OTHER URBAN AREAS	37.6	0.0	18.1	25.5
6	LA	TOTAL FOR STATE	128.2	0.0	130.0	69.5
6	NM	ALBUQUERQUE	36.5	0.0	16.0	20.4
6	NM	OTHER URBAN AREAS	50.9	0.0	22.3	20.5
6	NM	TOTAL FOR STATE	87.4	0.0	38.3	48.9
6	OK	LAWTON	15.8	0.0	2.3	4.3
6	OK	OKLAHOMA CITY	137.7	0.0	20.3	40.3
6	OK	TULSA	66.6	0.0	10.5	10.7
6	OK	OTHER URBAN AREAS	145.7	0.0	34.9	70.9
6	OK	TOTAL FOR STATE	365.8	0.0	87.6	145.3
6	TX	ARILENE	36.7	0.0	4.1	0.8
6	TX	AMARILLO	22.5	0.0	6.6	1.0
6	TX	AUSTIN	24.8	0.0	5.9	10.4
6	TX	BFAIMONT	3.8	0.0	1.1	0.3
6	TX	BROWNSVILLE	3.8	0.0	4.4	0.0
6	TX	BOYAN	14.0	0.0	0.0	0.0
6	TX	CORPUS CHRISTI	53.8	0.0	10.6	4.4
6	TX	DALLAS	254.6	0.0	74.2	11.6
6	TX	EL PASO	35.9	0.0	18.3	3.0
6	TX	FORT WORTH	160.9	0.0	34.2	0.0
6	TX	GALVESTON	7.2	1.1	2.2	4.4
6	TX	HARLINGEN	14.7	0.0	1.9	0.0
6	TX	HOUSTON	150.9	0.0	6.6	8.8
6	TX	LAREDO	6.0	0.0	4.4	0.0
6	TX	LUBROCK	29.4	0.0	7.4	1.5
6	TX	MCCALLEN	10.2	0.0	5.0	3.3
6	TX	MYDLAND	12.4	0.0	7.0	1.7
6	TX	ODESSA	6.7	0.0	2.7	0.0
6	TX	PORT ARTHUR	30.6	0.0	2.4	4.4
6	TX	SAN ANGELO	13.2	0.0	1.1	0.0
6	TX	SAN ANTONIO	56.9	0.0	11.6	4.4
6	TX	SHERMAN	14.8	0.0	1.1	0.0
6	TX	TEXARKANA	12.1	0.0	1.9	0.0
6	TX	TEXAS CITY	40.6	0.0	4.4	1.1
6	TX	TYLER	8.5	0.0	3.2	0.0
6	TX	WACO	40.5	0.0	4.2	0.0
6	TX	WICHITA FALL	14.5	0.0	4.4	0.0
6	TX	OTHER URBAN AREAS	319.2	1.1	109.5	139.8
6	TX	TOTAL FOR STATE	1426.8	5.1	489.3	624.8
6		TOTAL FOR REGION 6	2185.2	16.7	775.3	970.9

TABLE III-6 LAND USE BY TYPE OF SEWERAGE SYSTEM

EPA REGION	STATE ID	URBANIZED AREA	AREA SERVED BY TYPE OF SYSTEM				TOTAL
			UNDV	COMB	STORM	UNSEW	
7	IA	CEDAR RAPIDS	22.5	0.0	6.5	10.6	39.7
7	IA	DAVENPORT	36.8	0.0	5.4	10.0	53.0
7	IA	DES MOINES	34.5	4.0	10.1	18.0	69.0
7	IA	DUBUOQUE	25.9	0.0	5.1	3.0	34.0
7	IA	STOIX CITY	25.1	0.0	4.9	2.0	32.0
7	IA	WATERLOO	28.6	0.0	4.7	2.0	35.3
7	IA	OTHER URBAN AREAS	168.4	4.6	39.8	105.9	278.7
7	IA	TOTAL FOR STATE	323.8	8.9	76.5	126.7	535.9
7	KS	KANSAS CITY METRO	23.6	6.4	10.4	14.6	55.0
7	KS	TOPEKA	17.5	3.7	3.4	4.9	33.0
7	KS	WICHITA	31.3	0.0	13.1	17.0	61.4
7	KS	OTHER URBAN AREAS	79.5	11.1	35.0	45.8	171.4
7	KS	TOTAL FOR STATE	151.9	21.3	66.8	87.6	327.5
7	MO	COLUMBIA	18.5	0.0	3.1	5.3	26.9
7	MO	KANSAS CITY	151.7	21.0	17.8	69.9	260.5
7	MO	SPRINGFIELD	34.2	0.0	0.0	0.0	34.2
7	MO	ST. JOSEPH	96.1	14.4	0.0	0.0	110.5
7	MO	OTHER URBAN AREAS	31.4	17.7	2.8	17.5	69.4
7	MO	TOTAL FOR STATE	331.6	163.6	29.8	185.4	710.4
7	NE	LYNDOLN	15.2	0.0	8.4	9.6	33.3
7	NE	OMAHA	40.7	20.9	5.3	29.8	96.6
7	NE	OTHER URBAN AREAS	23.2	8.7	5.7	16.4	54.0
7	NE	TOTAL FOR STATE	79.1	29.6	19.4	55.8	183.9
7		TOTAL FOR REGION 7	886.4	223.3	192.6	455.5	1757.7
8	CO	BOULDER	2.4	0.0	4.4	1.9	9.0
8	CO	COLORADO SPRINGS	31.5	0.0	10.3	15.6	57.6
8	CO	DENVER	73.6	0.0	50.3	32.9	156.8
8	CO	PUEBLO	28.7	1.0	3.0	1.0	33.7
8	CO	OTHER URBAN AREAS	25.3	0.0	17.7	17.0	60.0
8	CO	TOTAL FOR STATE	140.5	1.0	98.1	94.5	334.9
8	MT	BILLINGS	8.6	0.0	4.0	4.7	17.3
8	MT	GREAT FALLS	6.0	0.0	0.0	0.0	6.0
8	MT	OTHER URBAN AREAS	23.6	0.0	15.0	12.2	50.8
8	MT	TOTAL FOR STATE	38.2	0.0	24.2	19.8	82.2
8	ND	FARGO	3.8	0.0	3.6	2.1	9.8
8	ND	OTHER URBAN AREAS	15.6	0.0	14.8	3.7	39.9
8	ND	TOTAL FOR STATE	19.5	1.0	18.5	10.8	49.7
8	SD	STOIX FALLS	8.3	0.2	3.8	5.1	17.3
8	SD	OTHER URBAN AREAS	24.5	0.5	11.2	15.0	51.1
8	SD	TOTAL FOR STATE	32.7	0.7	15.0	20.1	68.4
8	UT	OGDEN	20.3	0.0	8.1	10.7	39.0
8	UT	PROVO	37.2	0.0	5.3	9.1	41.6
8	UT	SALT LAKE CITY	59.0	0.0	26.3	32.4	117.8
8	UT	OTHER URBAN AREAS	17.6	0.0	6.6	8.6	32.8
8	UT	TOTAL FOR STATE	124.1	0.0	46.3	60.8	231.2
8	WY	URBAN AREAS	24.6	0.0	11.3	13.4	49.3
8	WY	TOTAL FOR STATE	24.6	0.0	11.3	13.4	49.3
8		TOTAL FOR REGION 8	379.5	3.4	213.3	219.3	815.6

TABLE III-6 LAND USE BY TYPE OF SEWERAGE SYSTEM							
EPA RFG	STATE ID	URBANIZED AREA	AREA SERVED BY TYPE OF SYSTEM				TOTAL
			UNDR	COMB	STORM	UNSEW	
1000 ACRES							
9	AK	URBAN AREAS	29.6	0.7	6.7	12.1	49.2
9	AK	TOTAL FOR STATE	29.6	0.7	6.7	12.1	49.2
9	A7	PHOENIX	137.5	0.0	49.6	61.2	248.3
9	A7	TUCSON	31.9	0.0	16.7	18.3	67.2
9	A7	OTHER URBAN AREAS	36.8	0.0	14.4	17.3	68.4
9	A7	TOTAL FOR STATE	206.2	0.0	80.7	97.1	384.0
9	CA	BAKERSFIELD	16.1	0.0	9.8	10.7	36.5
9	CA	FRESNO	20.9	0.0	16.4	13.2	50.6
9	CA	LOS ANGELES	245.4	0.0	588.3	192.5	1026.1
9	CA	MODESTO	9.5	0.0	6.7	5.9	21.8
9	CA	OXNARD	40.1	0.0	12.7	15.9	71.7
9	CA	SACRAMENTO	78.3	5.6	29.7	42.6	156.2
9	CA	SALYNAS	3.3	0.0	4.6	3.2	9.8
9	CA	SAN BERNARDINO	120.3	0.0	29.5	48.7	198.4
9	CA	SAN DIEGO	105.9	0.0	67.2	70.9	243.8
9	CA	SAN FRANCISCO	135.9	54.1	80.5	168.3	438.8
9	CA	SAN JOSE	66.3	0.0	55.8	55.1	177.4
9	CA	SANTA BARBARA	9.3	0.0	8.8	5.6	23.7
9	CA	SANTA ROSA	14.4	0.0	7.7	7.3	24.3
9	CA	SEASIDE	5.3	0.0	8.9	1.1	15.4
9	CA	STMT VALLEY	8.7	0.0	2.9	4.4	16.0
9	CA	STOCKTON	12.2	0.0	10.6	7.3	30.1
9	CA	OTHER URBAN AREAS	110.2	7.4	115.5	77.9	311.0
9	CA	TOTAL FOR STATE	1002.0	67.1	1050.4	708.7	2828.1
9	HI	HONOLULU	26.5	0.0	25.5	21.5	73.6
9	HI	OTHER URBAN AREAS	11.8	0.0	11.3	9.6	32.6
9	HI	TOTAL FOR STATE	38.3	0.0	36.9	31.1	106.2
9	NV	LAS VEGAS	46.0	0.0	12.2	19.2	77.4
9	NV	RENO	12.1	2.4	2.6	7.3	24.3
9	NV	OTHER URBAN AREAS	10.2	0.4	2.6	4.6	17.8
9	NV	TOTAL FOR STATE	68.3	2.8	17.3	31.1	119.6
9		TOTAL FOR REGION 9	1344.4	70.6	1191.9	880.1	3487.0
10	ID	BOISE	8.5	0.0	4.8	5.2	18.6
10	ID	OTHER URBAN AREAS	30.3	0.0	17.1	18.6	65.9
10	ID	TOTAL FOR STATE	38.8	0.0	21.9	23.8	84.5
10	OR	EUGENE	18.0	0.5	7.1	9.6	35.2
10	OR	PORTLAND	75.2	24.2	22.3	49.3	170.9
10	OR	SALEM	12.1	0.0	5.1	6.5	23.7
10	OR	OTHER URBAN AREAS	34.5	8.1	11.3	21.4	75.2
10	OR	TOTAL FOR STATE	139.8	32.7	45.7	86.7	305.0
10	WA	SEATTLE	119.2	37.9	32.7	74.5	264.3
10	WA	SPOKANE	22.8	19.4	0.0	7.7	49.9
10	WA	TACOMA	41.7	0.7	17.3	22.8	82.6
10	WA	OTHER URBAN AREAS	68.9	21.8	18.8	39.4	148.8
10	WA	TOTAL FOR STATE	252.6	79.9	68.8	144.3	545.6
10		TOTAL FOR REGION 10	431.2	112.6	136.5	254.8	935.1
		TOTAL FOR THE U.S.	13409.4	2248.4	5987.7	7393.3	29037.8

2. Storm Sewers ( $P_s$ ):

$$P_s = \frac{A}{100} \int_{x_1}^{x_2} a \cdot x^b dx - P_c \quad (\text{III-14})$$

3. Unsewered ( $P_u$ ):

$$P_u = P - P_c - P_s \quad (\text{III-15})$$

where  $A$  = total acreage of urbanized area, and

$P$  = total population of urbanized area.

The resulting population by type of sewerage system is shown in Table III-7, Population by Type of Sewerage System. The population densities by type of sewer system are shown in Table III-8, Developed Population Density by Type of Sewerage System. Lastly, the values of the coefficients used in the above calculations are shown in Table III-9, Values of Coefficients.

TABLE III-7		POPULATION BY TYPE OF SEWERAGE SYSTEM				
EPA REG	STATE ID	URBANIZED AREA	POPULATION SERVED (1000 PERSONS)			TOTAL
			COMB	STORM	UNSEW	
1	CT	BRIDGEPORT	72.	214.	127.	413.
1	CT	BRISTOL	0.	50.	22.	72.
1	CT	DANBURY	0.	42.	23.	65.
1	CT	HARTFORD	275.	81.	109.	465.
1	CT	MERTIDEN	0.	44.	34.	98.
1	CT	NEW BRITAIN	0.	97.	34.	131.
1	CT	NEW HAVEN	170.	76.	93.	349.
1	CT	NORWALK	55.	19.	33.	107.
1	CT	STAMFORD	0.	124.	61.	185.
1	CT	WATERBURY	22.	25.	50.	157.
1	CT	OTHER URBAN AREAS	89.	126.	86.	301.
1	CT	TOTAL FOR STATE	692.	979.	673.	2344.
1	ME	LEWISTON	48.	0.	17.	65.
1	ME	PORTLAND	77.	0.	29.	106.
1	ME	OTHER URBAN AREAS	246.	0.	90.	336.
1	ME	TOTAL FOR STATE	372.	0.	135.	507.
1	MA	BOSTON	335.	1798.	510.	2652.
1	MA	BROCKTON	0.	104.	45.	149.
1	MA	FALL RIVER	92.	11.	36.	139.
1	MA	FITCHBURG	21.	20.	28.	78.
1	MA	LAWRENCE	123.	0.	77.	200.
1	MA	LOWELL	87.	48.	48.	183.
1	MA	NEW BEDFORD	101.	9.	24.	134.
1	MA	PITTSFIELD	100.	41.	22.	163.
1	MA	SPRINGFIELD	254.	0.	260.	514.
1	MA	WORCESTER	34.	138.	75.	247.
1	MA	OTHER URBAN AREAS	100.	227.	118.	454.
1	MA	TOTAL FOR STATE	1155.	2404.	1254.	4813.
1	NH	MANCHESTER	71.	0.	24.	95.
1	NH	NASHUA	36.	0.	25.	61.
1	NH	OTHER URBAN AREAS	179.	0.	82.	261.
1	NH	TOTAL FOR STATE	286.	0.	131.	417.
1	RI	PROVIDENCE	333.	267.	195.	795.
1	RI	OTHER URBAN AREAS	13.	10.	8.	31.
1	RI	TOTAL FOR STATE	346.	278.	202.	826.
1	VT	URBAN AREAS	69.	0.	74.	143.
1	VT	TOTAL FOR STATE	69.	0.	74.	143.
1		TOTAL FOR REGION 1	2919.	3641.	2470.	9050.
2	NJ	ATLANTIC CITY	0.	94.	40.	134.
2	NJ	NEW YORK CITY METRO	204.	4102.	1382.	5688.
2	NJ	PHILADELPHIA METRO	201.	0.	1.	202.
2	NJ	TRENTON	0.	234.	40.	274.
2	NJ	VINELAND	0.	42.	32.	74.
2	NJ	TOTAL FOR STATE	405.	4473.	1495.	6372.
2	NY	ALBANY	271.	94.	120.	486.
2	NY	BINGHAMPTON	145.	0.	22.	167.
2	NY	BUFFALO	642.	206.	148.	1086.
2	NY	NEW YORK CITY	6764.	3755.	0.	10519.
2	NY	ROCHESTER	240.	243.	118.	601.
2	NY	SYRACUSE	159.	141.	76.	376.
2	NY	UTICA	30.	86.	65.	180.
2	NY	OTHER URBAN AREAS	1351.	755.	90.	2196.
2	NY	TOTAL FOR STATE	9603.	5369.	639.	15611.
2		TOTAL FOR REGION 2	10007.	9842.	2134.	21983.

TABLE III-7 POPULATION BY TYPE OF SEWERAGE SYSTEM

EPA REG	STATE ID	URBANIZED AREA	POPULATION SERVED (1000 PERSONS)			TOTAL
			COMB	STORM	UNSEW	
3	DE	WILMINGTON	7A.	198.	95.	371.
		OTHER URBAN AREAS	5.	13.	6.	24.
3	DE	TOTAL FOR STATE	83.	210.	101.	395.
3	DC	WASHINGTON, D.C.	400.	357.	0.	757.
		TOTAL FOR STATE	400.	357.	0.	757.
3	MD	BALTIMORE	0.	1366.	214.	1580.
		WASHINGTON DC METRO	0.	393.	100.	473.
		OTHER URBAN AREAS	0.	806.	146.	952.
3	MD	TOTAL FOR STATE	0.	2545.	460.	3005.
3	PA	ALLENTOWN	5.	276.	83.	364.
		ALTOONA	5.	420.	131.	551.
		ERIE	5.	330.	101.	431.
		HARRISBURG	5.	174.	62.	236.
		JOHNSTOWN	5.	55.	17.	72.
		LANCASTER	5.	55.	17.	72.
		PHILADELPHIA	15.	3290.	370.	3660.
		PITTSBURGH	6.	853.	326.	1179.
		READING	14.	141.	57.	198.
		SCRANTON	7.	0.	56.	63.
		WILKES-BARRE	14.	0.	73.	87.
		YORK	15.	91.	33.	124.
3	PA	TOTAL FOR STATE	1354.	5802.	1277.	8433.
3	VA	LYNCHBERG	7.	0.	0.	7.
		NEWPORT NEWS	0.	170.	90.	260.
		NORFOLK	0.	485.	183.	668.
		PETERSBURG	0.	74.	27.	101.
		RICHMOND	200.	92.	124.	416.
		ROANOKE	0.	90.	62.	152.
		WASHINGTON DC METRO	24.	1227.	0.	1251.
3	VA	TOTAL FOR STATE	29A.	2143.	492.	2933.
3	WV	CHARLESTON	84.	23.	51.	158.
		HUNTINGTON	121.	0.	0.	121.
		STEUBENVILLE METRO	40.	0.	0.	40.
		WHEELING	67.	3.	23.	93.
		OTHER URBAN AREAS	203.	17.	48.	268.
3	WV	TOTAL FOR STATE	515.	42.	122.	680.
3		TOTAL FOR REGION 3	2651.	11100.	2451.	16203.

TABLE III-7 POPULATION BY TYPE OF SEWERAGE SYSTEM

EPA RFG	STATE ID	URBANIZED AREA	POPULATION SERVED (1000 PERSONS)			
			COMB	STORM	UNSEW	TOTAL
4	AL	BIRMINGHAM	0.	351.	207.	558.
4	AL	GADSDEN	0.	43.	25.	68.
4	AL	HUNTSVILLE	0.	86.	50.	146.
4	AL	MOBILE	0.	159.	99.	258.
4	AL	MONTGOMERY	0.	95.	44.	139.
4	AL	TUSCALOOSA	0.	30.	56.	86.
4	AL	OTHER URBAN AREAS	0.	445.	291.	736.
4	AL	TOTAL FOR STATE	0.	1238.	773.	2011.
4	FL	FT. LAUDERDALE	0.	441.	173.	614.
4	FL	GAINESVILLE	0.	40.	29.	69.
4	FL	JACKSONVILLE	0.	356.	174.	530.
4	FL	MIAMI	0.	1038.	182.	1220.
4	FL	ORLANDO	4.	215.	86.	301.
4	FL	PENSACOLA	0.	113.	54.	167.
4	FL	ST. PETERSBURG	0.	348.	127.	495.
4	FL	TALLAHASSEE	0.	54.	24.	78.
4	FL	TAMPA	0.	275.	94.	369.
4	FL	WEST PALM BEACH	0.	181.	107.	288.
4	FL	OTHER URBAN AREAS	1.	992.	337.	1330.
4	FL	TOTAL FOR STATE	6.	4075.	1385.	5465.
4	GA	ALBANY	76.	0.	0.	76.
4	GA	ATLANTA	108.	636.	429.	1173.
4	GA	AUGUSTA	73.	0.	76.	149.
4	GA	COLUMBUS	47.	41.	101.	209.
4	GA	MACON	0.	84.	44.	128.
4	GA	SAVANNAH	100.	12.	52.	164.
4	GA	OTHER URBAN AREAS	185.	343.	321.	869.
4	GA	TOTAL FOR STATE	590.	1156.	1022.	2768.
4	KY	HUNTINGTON METRO	7.	20.	20.	47.
4	KY	LEXINGTON	0.	131.	29.	160.
4	KY	LOUISVILLE	22.	545.	172.	739.
4	KY	OWENSBORO	30.	7.	6.	53.
4	KY	OTHER URBAN AREAS	47.	484.	157.	688.
4	KY	TOTAL FOR STATE	116.	1187.	384.	1887.
4	MS	BILOXI	0.	61.	60.	121.
4	MS	JACKSON	0.	127.	63.	190.
4	MS	OTHER URBAN AREAS	0.	408.	268.	676.
4	MS	TOTAL FOR STATE	0.	596.	391.	987.
4	NC	ASHEVILLE	0.	50.	22.	72.
4	NC	CHARLOTTE	0.	175.	105.	280.
4	NC	DURHAM	0.	47.	54.	101.
4	NC	FAYETTEVILLE	0.	91.	70.	161.
4	NC	GREENSBORO	0.	103.	49.	152.
4	NC	HIGHPOINT	0.	28.	66.	94.
4	NC	RALEIGH	0.	84.	68.	152.
4	NC	WILMINGTON	0.	41.	17.	58.
4	NC	WINSTON-SALEM	0.	78.	64.	142.
4	NC	OTHER URBAN AREAS	0.	618.	457.	1075.
4	NC	TOTAL FOR STATE	0.	1315.	972.	2287.
4	SC	CHARLESTON	0.	128.	100.	228.
4	SC	COLUMBIA	0.	138.	104.	242.
4	SC	GREENVILLE	0.	88.	69.	157.
4	SC	OTHER URBAN AREAS	0.	342.	264.	606.
4	SC	TOTAL FOR STATE	0.	697.	536.	1233.
4	TN	CHATTANOOGA	26.	102.	96.	224.
4	TN	KNOXVILLE	0.	107.	83.	190.
4	TN	MEMPHIS	0.	505.	159.	664.
4	TN	NASHVILLE	180.	113.	155.	448.
4	TN	OTHER URBAN AREAS	106.	423.	253.	781.
4	TN	TOTAL FOR STATE	312.	1249.	746.	2307.
4		TOTAL FOR REGION 4	1024.	11512.	6209.	18745.

TABLE III-7 POPULATION BY TYPE OF SEWERAGE SYSTEM POPULATION SERVED

EPA REGION	STATE ID	URBANIZED AREA	POPULATION (1000 PERSONS)			TOTAL
			COMB	STORM	UNSEW	
5	IL	AURORA	0	173	60	233
		BLOMINGTON	0	52	17	69
		CHAMPAIGN	0	91	9	100
		CHICAGO	4416	545	753	5714
		DAVENPORT METRO	56	24	32	112
		DECATUR	54	0	46	100
		JOLIET	0	110	44	154
		PROFIA	117	0	131	247
		ROCKFORD	33	157	40	206
		SPRINGFIELD	33	40	28	101
		OTHER URBAN AREAS	1433	371	359	2163
5	IL	TOTAL FOR STATE	6109	1582	1530	9221
5	IN	ANDERSON	81	0	0	81
		CHICAGO METRO	453	304	243	1000
		EVANSVILLE	149	0	0	149
		FORT WAYNE	114	56	55	225
		INDIANAPOLIS	456	157	207	810
		LAFAYETTE	73	7	0	79
		MUNCIE	47	23	15	90
		SOUTH BEND	175	0	113	288
		TERRA HAUTE	0	29	42	71
		OTHER URBAN AREAS	309	120	136	565
5	IN	TOTAL FOR STATE	1845	715	811	3371
5	MI	ANN ARBOR	0	147	32	179
		BAY CITY	45	0	33	78
		DETROIT	2475	804	691	3970
		FLINT	13	235	82	330
		GRAND RAPIDS	64	182	106	353
		JACKSON	39	0	0	39
		KALAMAZOO	0	0	56	56
		LANSING	85	81	64	230
		MUSKEGON	0	71	35	106
		SAGINAW	103	0	46	149
		OTHER URBAN AREAS	469	269	197	935
5	MI	TOTAL FOR STATE	3293	1885	1382	6559
5	MN	DULUTH	31	33	41	105
		FARGO METRO	32	4	5	41
		MINNEAPOLIS	389	830	482	1701
		ROCHESTER	0	47	10	57
		OTHER URBAN AREAS	148	304	179	630
5	MN	TOTAL FOR STATE	593	1218	716	2527
5	OH	AKRON	0	389	154	543
		CANTON	20	143	61	244
		CINCINNATI	778	73	289	1110
		CLEVELAND	665	924	372	1960
		COLUMBUS	175	437	178	790
		DAYTON	0	502	188	688
		HAMILTON	35	25	24	91
		LYMA	78	0	0	78
		LORAIN	5	140	0	145
		MANSFIELD	0	26	6	32
		SPRINGFIELD	0	52	52	104
		STEUBENVILLE	72	11	11	94
		TOLEDO	45	0	0	45
		YOUNGSTOWN	204	142	142	488
		OTHER URBAN AREAS	172	115	110	397
5	OH	TOTAL FOR STATE	2647	3429	1944	8021
5	WI	APPLETON	29	71	30	130
		DULUTH METRO	0	18	15	33
		GREEN BAY	10	48	71	129
		KENOSHA	20	45	0	65
		LA CROSSE	6	24	0	30
		MADISON	0	151	234	385
		MILWAUKEE	410	362	472	1244
		OSHKOSH	0	55	0	55
		RAFTINE	0	99	18	117
		OTHER URBAN AREAS	197	368	278	843
5	WI	TOTAL FOR STATE	679	1272	960	2911
5		TOTAL FOR REGION 5	15166	10101	7343	32610

TABLE III-7		POPULATION BY TYPE OF SEWERAGE SYSTEM				
EPA RFG	STATE ID	URBANIZED AREA	POPULATION SERVED (1000 PERSONS)			TOTAL
			COMB	STORM	UNSEW	
6	AR	FORT SMITH	30.	0.	46.	76.
6	AR	LITTLE ROCK	0.	89.	134.	223.
6	AR	PINE BLUFF	0.	40.	21.	61.
6	AR	OTHER URBAN AREAS	50.	216.	336.	602.
6	AR	TOTAL FOR STATE	80.	345.	537.	962.
6	LA	BATON ROUGE	0.	172.	77.	249.
6	LA	LAFAYETTE	0.	55.	23.	78.
6	LA	LAKE CHARLES	0.	54.	34.	88.
6	LA	MONROE	0.	39.	51.	90.
6	LA	NEW ORLEANS	0.	962.	0.	962.
6	LA	SHREVEPORT	0.	140.	94.	234.
6	LA	OTHER URBAN AREAS	0.	589.	116.	705.
6	LA	TOTAL FOR STATE	0.	2012.	394.	2406.
6	NM	ALBUQUERQUE	0.	203.	94.	297.
6	NM	OTHER URBAN AREAS	0.	282.	132.	414.
6	NM	TOTAL FOR STATE	0.	485.	226.	711.
6	OK	LAWTON	0.	40.	56.	96.
6	OK	OKLAHOMA CITY	0.	404.	176.	580.
6	OK	TULSA	0.	249.	122.	371.
6	OK	OTHER URBAN AREAS	0.	458.	235.	693.
6	OK	TOTAL FOR STATE	0.	1150.	590.	1740.
6	TX	ARILENE	0.	59.	31.	90.
6	TX	AMARILLO	0.	85.	42.	127.
6	TX	AUSTIN	0.	188.	76.	264.
6	TX	BEAUMONT	38.	42.	37.	116.
6	TX	BROWNSVILLE	0.	43.	10.	53.
6	TX	BRYAN	0.	35.	16.	51.
6	TX	CORPUS CHRISTI	0.	147.	66.	213.
6	TX	DALLAS	0.	1011.	327.	1338.
6	TX	EI PASO	0.	252.	85.	337.
6	TX	FORT WORTH	0.	471.	206.	677.
6	TX	GALVESTON	40.	0.	22.	62.
6	TX	HARLINGEN	0.	9.	41.	50.
6	TX	HOUSTON	1.	1183.	494.	1678.
6	TX	LAREDO	0.	50.	20.	70.
6	TX	LUBBOCK	0.	77.	73.	150.
6	TX	MCALEEN	0.	52.	39.	91.
6	TX	MIDLAND	0.	19.	41.	60.
6	TX	ODESSA	0.	60.	22.	82.
6	TX	PORT ARTHUR	0.	50.	66.	116.
6	TX	SAN ANGELO	0.	31.	43.	64.
6	TX	SAN ANTONIO	0.	590.	182.	772.
6	TX	SHERMAN	0.	12.	43.	55.
6	TX	TEXARKANA	0.	18.	40.	58.
6	TX	TEXAS CITY	0.	50.	34.	84.
6	TX	TYLER	0.	35.	25.	60.
6	TX	WACO	0.	77.	42.	119.
6	TX	WICHITA FALL	0.	45.	53.	98.
6	TX	OTHER URBAN AREAS	23.	1350.	627.	1999.
6	TX	TOTAL FOR STATE	101.	6031.	2801.	8934.
6		TOTAL FOR REGION 6	181.	10073.	4549.	14753.

EPA REG	STATE ID	URBANIZED AREA	POPULATION SERVED (1000 PERSONS)			TOTAL
			COMB	STORM	UNSEW	
7	IA	CEDAR RAPIDS	0	72	60	132
7	IA	DAVENPORT	3	55	46	114
7	IA	DES MOINES	118	59	78	255
7	IA	DUBUQUE	0	51	14	65
7	IA	SIoux CITY	0	55	31	86
7	IA	WATERLOO	0	50	63	113
7	IA	OTHER URBAN AREAS	131	302	317	740
7	IA	TOTAL FOR STATE	252	754	609	1615
7	KS	KANSAS CITY METRO	76	122	76	274
7	KS	TOPEKA	45	41	46	132
7	KS	WICHITA	0	202	100	302
7	KS	OTHER URBAN AREAS	133	402	242	777
7	KS	TOTAL FOR STATE	254	768	463	1485
7	MO	COLUMBIA	0	38	21	59
7	MO	KANSAS CITY	308	117	403	828
7	MO	SPRINGFIELD	0	74	47	121
7	MO	ST. JOSEPH	77	0	0	77
7	MO	ST. LOUIS	1096	0	788	1883
7	MO	OTHER URBAN AREAS	155	24	131	310
7	MO	TOTAL FOR STATE	1635	254	1389	3278
7	NE	LINCOLN	0	100	44	153
7	NE	OMAHA	296	75	121	492
7	NE	OTHER URBAN AREAS	123	76	69	268
7	NE	TOTAL FOR STATE	419	240	234	913
7		TOTAL FOR REGION 7	2559	2036	2695	7291
8	CO	BOULDER	0	59	10	69
8	CO	COLORADO SPRINGS	0	118	87	205
8	CO	DENVER	8	503	236	1047
8	CO	PUEBLO	22	52	29	103
8	CO	OTHER URBAN AREAS	7	227	79	313
8	CO	TOTAL FOR STATE	36	1240	441	1737
8	MT	BILLINGS	0	45	26	71
8	MT	GREAT FALLS	0	53	18	71
8	MT	OTHER URBAN AREAS	0	158	72	230
8	MT	TOTAL FOR STATE	0	256	116	372
8	ND	FARGO	2	39	13	54
8	ND	OTHER URBAN AREAS	8	158	54	220
8	ND	TOTAL FOR STATE	10	197	67	274
8	SD	SIoux FALLS	2	46	27	75
8	SD	OTHER URBAN AREAS	6	137	79	222
8	SD	TOTAL FOR STATE	8	183	106	297
8	UT	OGDEN	0	101	49	150
8	UT	PROVO	0	70	34	104
8	UT	SALT LAKE CITY	0	325	144	479
8	UT	OTHER URBAN AREAS	0	83	38	121
8	UT	TOTAL FOR STATE	0	589	265	854
8	WY	URBAN AREAS	0	126	75	201
8	WY	TOTAL FOR STATE	0	126	75	201
8		TOTAL FOR REGION 8	55	2610	1070	3735

EPA RFG	STATE ID	URBANIZED AREA	POPULATION BY TYPE OF SEWERAGE SYSTEM			TOTAL
			POPULATION SERVED (1000 PERSONS)			
			COMB	STORM	UNSEW	
9	AK	URBAN AREAS	10.	93.	44.	147.
9	AK	TOTAL FOR STATE	10.	93.	44.	147.
9	AZ	PHOENIX	0.	620.	243.	863.
9	AZ	TUCSON	0.	192.	102.	294.
9	AZ	OTHER URBAN AREAS	0.	176.	75.	251.
9	AZ	TOTAL FOR STATE	0.	989.	419.	1408.
9	CA	BAKERSFIELD	0.	129.	47.	176.
9	CA	FRESNO	0.	195.	68.	263.
9	CA	LOS ANGELES	0.	7474.	877.	8351.
9	CA	MODESTO	0.	75.	31.	106.
9	CA	OXNARD	0.	167.	76.	243.
9	CA	SACRAMENTO	70.	371.	193.	634.
9	CA	SALTINAS	0.	52.	10.	62.
9	CA	SAN BERNARDINO	0.	414.	170.	584.
9	CA	SAN DIEGO	0.	882.	116.	998.
9	CA	SAN FRANCISCO	141.	1095.	486.	1688.
9	CA	SAN JOSE	0.	796.	229.	1025.
9	CA	SANTA BARBARA	0.	49.	31.	80.
9	CA	SANTA ROSA	0.	26.	49.	75.
9	CA	SEASIDE	0.	25.	8.	33.
9	CA	STMT VALLEY	0.	32.	25.	57.
9	CA	STOCKTON	0.	120.	40.	160.
9	CA	OTHER URBAN AREAS	183.	1484.	328.	1995.
9	CA	TOTAL FOR STATE	1663.	13493.	2986.	18142.
9	HI	HONOLULU	0.	346.	96.	442.
9	HI	OTHER URBAN AREAS	0.	153.	43.	196.
9	HI	TOTAL FOR STATE	0.	499.	139.	638.
9	NV	LAS VEGAS	0.	157.	80.	237.
9	NV	RENO	35.	27.	38.	100.
9	NV	OTHER URBAN AREAS	6.	32.	21.	59.
9	NV	TOTAL FOR STATE	41.	217.	139.	396.
9		TOTAL FOR REGION 9	1713.	15291.	3727.	20731.
10	ID	BOISE	0.	51.	34.	85.
10	ID	OTHER URBAN AREAS	0.	181.	121.	302.
10	ID	TOTAL FOR STATE	0.	232.	155.	387.
10	OR	EUGENE	6.	85.	47.	139.
10	OR	PORTLAND	316.	291.	219.	825.
10	OR	SALEM	0.	56.	37.	93.
10	OR	OTHER URBAN AREAS	105.	142.	99.	346.
10	OR	TOTAL FOR STATE	427.	574.	402.	1403.
10	WA	SEATTLE	483.	417.	338.	1238.
10	WA	SPOKANE	165.	0.	65.	230.
10	WA	TACOMA	8.	216.	108.	332.
10	WA	OTHER URBAN AREAS	246.	237.	191.	675.
10	WA	TOTAL FOR STATE	903.	871.	701.	2475.
10		TOTAL FOR REGION 10	1330.	1677.	1258.	4265.
		TOTAL FOR THE U.S.	37606.	77853.	33906.	149366.

TABLE XII-8 DEVELOPED POPULATION DENSITY BY TYPE OF SEWERAGE SYSTEM

EPA REG	STATE ID	URBANIZED AREA	DEVELOPED POPULATION DENSITY (PERSONS/ACRE)			
			COMB	STORM	UNSEW	AVER
1	CT	BRIDGEPORT	12.73	13.71	4.77	8.71
1	CT	BRISTOL	10.00	11.00	3.65	7.53
1	CT	DANBURY	13.00	13.00	4.98	6.89
1	CT	HARTFORD	13.25	13.25	4.48	6.08
1	CT	MERIDEN	0.00	11.55	5.87	7.03
1	CT	NEW BRITAIN	0.00	11.30	5.50	6.89
1	CT	NEW HAVEN	11.98	11.98	5.07	6.78
1	CT	NORWALK	36.67	44.44	4.43	8.10
1	CT	STAMFORD	0.00	12.00	4.98	6.19
1	CT	WATERBURY	12.45	12.45	4.69	6.16
1	CT	OTHER URBAN AREAS	13.47	11.84	4.63	6.39
1	CT	AVE. FOR STATE	13.47	11.84	4.63	6.39
1	ME	LEWISTON	10.28	0.00	3.30	6.66
1	ME	PORTLAND	7.48	0.00	4.48	7.48
1	ME	OTHER URBAN AREAS	8.36	0.00	5.12	7.15
1	ME	AVE. FOR STATE	8.36	0.00	5.12	7.15
1	MA	BOSTON	15.81	15.81	3.71	9.54
1	MA	BROCKTON	0.00	11.59	4.63	6.35
1	MA	FALL RIVER	12.71	12.71	4.68	6.66
1	MA	FITCHBURG	11.71	11.71	4.93	7.66
1	MA	LAWRENCE	13.06	13.06	5.33	8.48
1	MA	LOWELL	13.06	13.06	5.06	8.49
1	MA	NEW BEDFORD	11.26	11.26	5.28	8.20
1	MA	PITTSFIELD	0.00	12.99	5.28	7.07
1	MA	SPRINGFIELD	7.73	0.00	4.73	6.73
1	MA	WORCESTER	16.29	11.03	5.16	8.48
1	MA	OTHER URBAN AREAS	11.34	14.98	4.53	8.93
1	MA	AVE. FOR STATE	11.34	14.98	4.53	8.93
1	NH	MANCHESTER	10.14	0.00	4.91	7.99
1	NH	NASHUA	9.39	0.00	5.39	7.39
1	NH	OTHER URBAN AREAS	9.02	0.00	5.92	7.75
1	NH	AVE. FOR STATE	9.02	0.00	5.92	7.75
1	RI	PROVIDENCE	15.85	11.60	4.20	8.79
1	RI	OTHER URBAN AREAS	15.85	11.60	4.20	8.79
1	RI	AVE. FOR STATE	15.85	11.60	4.20	8.79
1	VT	URBAN AREAS	8.75	0.00	7.73	8.19
1	VT	AVE. FOR STATE	8.75	0.00	7.73	8.19
1		AVE. FOR REGION 1	11.27	13.71	4.67	8.58
2	NJ	ATLANTIC CITY	0.00	13.91	3.64	7.58
2	NJ	NEW YORK CITY METRO	32.84	15.19	5.39	8.32
2	NJ	PHILADELPHIA METRO	9.90	10.00	5.76	9.68
2	NJ	TRENTON	0.00	11.24	5.56	9.78
2	NJ	VINELAND	0.00	10.70	4.37	6.59
2	NJ	AVE. FOR STATE	15.27	14.83	3.45	8.37
2	NY	ALBANY	14.06	14.06	4.07	8.75
2	NY	BINGHAMPTON	9.55	0.00	5.59	8.74
2	NY	BUFFALO	16.76	9.12	4.84	10.71
2	NY	NEW YORK CITY	62.46	27.87	0.00	43.28
2	NY	ROCHESTER	16.83	16.83	5.53	9.67
2	NY	SYRACUSE	12.06	12.06	1.11	9.46
2	NY	UTICA	11.91	11.91	0.00	7.96
2	NY	OTHER URBAN AREAS	39.10	22.27	4.38	24.68
2	NY	AVE. FOR STATE	39.10	22.27	4.38	24.68
2		AVE. FOR REGION 2	36.78	18.14	3.68	15.77

TABLE III-8 DEVELOPED POPULATION DENSITY BY TYPE OF SEWERAGE SYSTEM

EPA REG	STATE ID	URBANIZED AREA	DEVELOPED POPULATION DENSITY (PERSONS/ACRE)			
			COMB	STORM	INSEW	AVER
3	DE	WILMINGTON	12.23	12.23	4.98	8.91
	DE	OTHER URBAN AREAS	12.23	12.23	4.98	8.91
3	DE	AVE. FOR STATE	12.23	12.23	4.98	8.91
3	DC	WASHINGTON, D.C.	31.40	14.24	0.0	20.02
	DC	AVE. FOR STATE	31.40	14.24	0.0	20.02
3	MD	BALTIMORE	0.0	13.27	4.84	10.74
	MD	WASHINGTON DC METRO	0.0	13.72	4.41	9.49
3	MD	OTHER URBAN AREAS	0.0	13.36	4.70	10.42
3	MD	AVE. FOR STATE	0.0	13.36	4.70	10.42
3	PA	ALLENTOWN	13.48	13.48	4.44	9.22
	PA	ALTOONA	11.29	11.29	5.53	9.66
	PA	ERIE	11.64	11.06	5.54	9.53
	PA	HARRISBURG	14.03	14.03	4.06	8.62
	PA	JOHNSTOWN	9.98	9.98	6.54	8.96
	PA	LANCASTER	11.12	11.12	5.64	8.53
	PA	PHILADELPHIA	14.59	12.64	5.10	11.11
	PA	PITTSBURGH	21.14	21.14	2.30	8.63
	PA	READING	0.0	11.25	5.55	9.65
	PA	SCRANTON	8.67	0.0	5.84	7.66
	PA	WYKES-BARRE	12.02	12.02	4.98	8.23
	PA	YORK	0.0	10.62	6.00	8.86
	PA	OTHER URBAN AREAS	15.17	13.43	3.74	9.80
	3	PA	AVE. FOR STATE	15.17	13.43	3.74
3	VA	LYNCHBERG	6.83	0.0	0.0	6.83
	VA	NEWPORT NEWS	0.0	12.75	4.20	7.47
	VA	NORFOLK	0.0	14.53	3.51	7.80
	VA	PETERSBURG	0.0	14.74	3.51	7.96
	VA	RICHMOND	12.61	12.61	4.71	8.41
	VA	ROANOKE	11.23	11.23	5.56	7.94
	VA	WASHINGTON DC METRO	16.00	14.12	0.0	14.16
	VA	OTHER URBAN AREAS	10.63	13.89	4.10	9.70
3	VA	AVE. FOR STATE	10.63	13.89	4.10	9.70
3	WV	CHARLESTON	12.34	12.34	4.71	8.10
	WV	HUNTINGTON	8.18	0.0	0.0	8.18
	WV	STEUBENVILLE METRO	6.06	0.0	0.0	6.06
	WV	WHEELING	10.02	10.02	6.54	8.85
	WV	OTHER URBAN AREAS	8.94	12.04	5.16	8.01
3	WV	AVE. FOR STATE	8.94	12.04	5.16	8.01
3		AVE. FOR REGION 3	13.63	13.49	4.08	10.01

TABLE III-8 DEVELOPED POPULATION DENSITY BY TYPE OF SEWERAGE SYSTEM

EPA RFG	STATE ID	URBANIZED AREA	DEVELOPED POPULATION DENSITY (PERSONS/ACRE)			
			COMB	STORM	UNSEW	AVER
4	AL	BIRMINGHAM	0.0	11.53	5.31	8.03
4	AL	GADSDEN	0.0	12.13	3.96	6.86
4	AL	HUNTSVILLE	0.0	12.37	4.31	7.16
4	AL	MOBILE	0.0	12.19	4.93	8.37
4	AL	MONTGOMERY	0.0	9.84	6.72	7.54
4	AL	TUSCALOOSA	0.0	11.78	4.86	7.61
4	AL	OTHER URBAN AREAS	0.0	11.78	4.86	7.61
4	AL	AVE. FOR STATE	0.0	11.78	4.86	7.61
4	FL	FT. LAUDERDALE	0.0	13.10	4.43	8.43
4	FL	GAINESVILLE	0.0	11.43	5.65	7.94
4	FL	JACKSONVILLE	0.0	10.70	5.87	7.14
4	FL	MIAMI	0.0	12.70	4.90	7.31
4	FL	ORLANDO	14.20	12.50	3.69	10.37
4	FL	PENSACOLA	0.0	12.55	4.61	8.08
4	FL	ST. PETERSBURG	0.0	12.34	4.05	8.61
4	FL	TALAHASSEE	0.0	12.94	4.41	8.15
4	FL	TAMPA	0.0	12.94	3.65	8.35
4	FL	WEST PALM BEACH	0.0	13.17	4.73	8.66
4	FL	OTHER URBAN AREAS	14.20	13.00	4.26	8.58
4	FL	AVE. FOR STATE	14.20	13.00	4.26	8.58
4	GA	ALBANY	6.33	0.0	0.0	6.33
4	GA	ATLANTA	11.44	0.0	0.0	11.44
4	GA	AUGUSTA	8.12	0.0	5.55	8.24
4	GA	COLUMBUS	11.06	0.0	5.12	8.12
4	GA	MACON	0.0	11.06	5.64	7.56
4	GA	SAVANNAH	15.38	12.04	4.93	8.06
4	GA	OTHER URBAN AREAS	9.81	11.25	5.62	8.03
4	GA	AVE. FOR STATE	9.81	11.25	5.62	8.03
4	KY	HUNTINGTON METRO	11.03	11.03	5.75	7.94
4	KY	LEXINGTON	0.0	11.49	9.55	5.55
4	KY	LOUISVILLE	14.20	14.20	4.55	9.05
4	KY	OWENSBORO	11.03	11.03	4.99	9.09
4	KY	OTHER URBAN AREAS	2.03	13.48	4.50	9.17
4	KY	AVE. FOR STATE	12.03	13.48	4.40	9.17
4	MS	BILOXI	0.0	11.00	5.14	7.48
4	MS	JACKSON	0.0	11.87	5.23	8.18
4	MS	OTHER URBAN AREAS	0.0	11.57	5.32	7.90
4	MS	AVE. FOR STATE	0.0	11.57	5.32	7.90
4	NC	ASHEVILLE	0.0	13.71	5.11	7.49
4	NC	CHARLOTTE	0.0	11.05	5.87	8.19
4	NC	DURHAM	0.0	10.17	5.63	7.91
4	NC	FAYETTEVILLE	0.0	11.18	5.59	7.77
4	NC	GREENSBORO	0.0	12.52	6.61	8.04
4	NC	HIGH POINT	0.0	9.55	5.76	7.41
4	NC	RALPHIGH	0.0	12.04	5.33	7.71
4	NC	WYLLINGTON	0.0	14.05	5.77	7.58
4	NC	WINSTON-SALEM	0.0	11.15	6.00	7.72
4	NC	OTHER URBAN AREAS	0.0	11.54	4.66	7.84
4	NC	AVE. FOR STATE	0.0	11.54	5.46	7.84
4	SC	CHARLESTON	0.0	11.01	5.76	7.86
4	SC	COLUMBIA	0.0	11.44	5.61	7.91
4	SC	GREENVILLE	0.0	11.18	5.59	7.78
4	SC	OTHER URBAN AREAS	0.0	11.22	5.66	7.86
4	SC	AVE. FOR STATE	0.0	11.22	5.66	7.86
4	TN	CHATTANOOGA	11.61	11.51	5.10	7.50
4	TN	KNOXVILLE	0.0	11.39	5.52	7.78
4	TN	MEMPHIS	0.0	14.14	4.11	8.92
4	TN	NASHVILLE	12.24	9.81	4.07	6.96
4	TN	OTHER URBAN AREAS	12.16	12.64	4.45	7.90
4	TN	AVE. FOR STATE	12.16	12.64	4.45	7.90
4		AVE. FOR REGION	10.68	12.33	4.90	8.16

TABLE III-8 DEVELOPED POPULATION DENSITY BY TYPE OF SEWERAGE SYSTEM

EPA REGION	STATE	URBANIZED AREA	DEVELOPED POPULATION DENSITY (PERSONS/ACRE)			
			CONR	STORM	INSEW	
5	IL	ARRORA	0.00	13.94	4.06	8.56
		BLOOMINGTON	0.00	12.33	4.43	8.99
		CHAMPAIGN	0.00	12.33	4.43	8.99
		CHICAGO	24.55	12.33	4.43	11.25
		DAVENPORT METRO	8.24	9.94	6.66	8.71
		DECATUR	8.24	10.00	6.66	8.24
		JOLIET	0.00	12.33	4.43	8.37
		PEORIA	7.87	10.00	7.00	7.87
		ROCKFORD	0.00	14.24	4.43	8.07
		SPRINGFIELD	11.29	11.29	5.51	9.00
IL	OTHER URBAN AREAS	19.91	7.24	4.75	10.88	
5	IL	AVE. FOR STATE	19.91	7.24	4.75	10.88
5	IN	ANDERSON	4.05	0.00	0.00	4.05
		CHICAGO METRO	12.01	14.01	4.01	8.89
		EVANSVILLE	8.90	0.00	0.00	8.90
		FORT WAYNE	13.16	14.40	4.40	8.79
		INDIANAPOLIS	13.40	13.40	3.40	7.73
		LAFAYETTE	4.50	0.00	0.00	4.50
		MUNCIE	9.91	9.91	0.00	9.91
		SOUTH BEND	8.64	0.00	0.00	8.64
		TERRA HAUTE	0.00	0.00	0.00	0.00
		IN	OTHER URBAN AREAS	10.99	12.48	4.34
5	IN	AVE. FOR STATE	10.99	12.48	4.34	8.19
5	MI	ANN ARBOR	0.00	11.26	5.24	9.71
		BAY CITY	8.53	0.00	0.00	8.53
		DETROIT	12.89	12.89	9.33	10.50
		FLINT	12.01	12.01	4.33	8.97
		GRAND RAPIDS	13.43	13.43	4.33	7.97
		JACKSON	8.80	0.00	0.00	8.80
		KALAMAZOO	0.00	12.33	6.66	7.74
		LANSING	11.87	11.87	4.33	8.88
		MUSKEGON	0.00	0.00	0.00	0.00
		MI	OTHER URBAN AREAS	14.08	12.08	6.68
5	MI	AVE. FOR STATE	14.08	12.08	6.68	9.57
5	MN	DULUTH	12.10	12.10	4.10	7.11
		FARGO METRO	9.02	9.02	5.44	7.00
		MINNEAPOLIS	12.57	12.57	4.09	7.92
		ROCHESTER	0.00	10.51	0.00	10.51
		MN	OTHER URBAN AREAS	12.37	12.51	4.14
5	MN	AVE. FOR STATE	12.37	12.41	4.14	7.92
5	OH	AKRON	0.00	14.41	4.41	8.70
		CANTON	0.00	14.41	4.41	8.70
		CINCINNATI	10.59	10.59	6.66	8.57
		CLEVELAND	16.97	16.97	5.55	11.99
		COLUMBUS	15.78	15.78	5.66	10.99
		DAYTON	0.00	14.22	4.00	8.60
		HAMILTON	14.73	14.73	5.11	8.75
		LIMA	6.93	0.00	0.00	6.93
		LORAIN	0.00	10.00	0.00	10.00
		MANSFIELD	0.00	10.85	0.85	7.77
		SPRINGFIELD	0.00	10.85	0.85	7.77
		STEUBENVILLE	10.71	10.71	0.71	10.00
		TOLEDO	12.84	12.84	4.43	8.88
		OH	YOUNGSTOWN	12.48	12.48	4.43
OH	OTHER URBAN AREAS	12.53	14.43	3.98	8.55	
5	OH	AVE. FOR STATE	12.53	14.43	3.98	8.55
5	WI	APPLETON	14.33	14.33	4.07	9.05
		DULUTH METRO	0.00	10.47	0.00	10.47
		GREEN BAY	10.73	10.73	7.76	7.76
		KENOSHA	13.93	13.93	5.11	10.76
		LA CROSSE	10.16	10.16	6.22	7.74
		MADISON	0.00	11.47	0.00	11.47
		MILWAUKEE	23.57	23.57	6.47	11.88
		OSHKOSH	0.00	9.79	0.00	9.79
		RACINE	0.00	11.24	0.00	11.24
		WI	OTHER URBAN AREAS	21.32	8.81	6.55
5	WI	AVE. FOR STATE	21.32	8.81	6.55	8.41
5		AVE. FOR REGION 5	15.17	11.08	4.49	8.19

TABLE III-8 DEVELOPED POPULATION DENSITY BY TYPE OF SEWERAGE SYSTEM

EPA RFG	STATE ID	URBANIZED AREA	DEVELOPED POPULATION DENSITY (PERSONS/ACRE)			
			COMB	STORM	INSEW	AVER
6	AR	FORT SMITH	6.93	0.0	6.93	6.93
6	AR	LITTLE ROCK	0.0	11.86	6.47	7.91
6	AR	PINE BLUFF	0.0	10.70	6.01	8.44
6	AR	OTHER URBAN AREAS	6.93	11.47	6.52	7.76
6	AR	AVE. FOR STATE	6.93	11.47	6.52	7.76
6	LA	BATON ROUGE	0.0	12.05	5.09	8.46
6	LA	LAFAYETTE	0.0	10.66	6.00	8.65
6	LA	LAKE CHARLES	0.0	11.12	5.66	8.13
6	LA	MONROE	0.0	10.36	5.57	7.81
6	LA	NEW ORLEANS	0.0	18.79	0.0	18.79
6	LA	SHREVEPORT	0.0	11.04	5.73	8.04
6	LA	OTHER URBAN AREAS	0.0	15.47	5.68	12.06
6	LA	AVE. FOR STATE	0.0	15.47	5.68	12.06
6	NM	ALBUQU	0.0	12.66	4.62	8.15
6	NM	OTHER URBAN AREAS	0.0	12.66	4.62	8.15
6	NM	AVE. FOR STATE	0.0	12.66	4.62	8.15
6	OK	LAWTON	0.0	10.09	6.66	7.75
6	OK	OKLAHOMA CITY	0.0	13.67	3.55	7.32
6	OK	TULSA	0.0	12.90	4.18	7.64
6	OK	OTHER URBAN AREAS	0.0	13.12	4.06	7.47
6	OK	AVE. FOR STATE	0.0	13.12	4.06	7.47
6	TX	ARILENE	0.0	12.23	3.74	6.83
6	TX	AMARILLO	0.0	13.03	4.15	7.66
6	TX	AUSTIN	0.0	11.81	5.16	8.60
6	TX	BEAUMONT	13.27	9.27	5.17	9.17
6	TX	BROWNSVILLE	0.0	9.33	6.54	9.07
6	TX	BRYAN	0.0	9.25	5.61	7.17
6	TX	CORPUS CHRISTI	0.0	11.50	5.77	8.55
6	TX	DALLAS	0.0	13.63	4.19	7.57
6	TX	EL PASO	0.0	13.67	3.87	8.32
6	TX	FORT WORTH	0.0	13.67	3.87	8.32
6	TX	GALVESTON	36.36	0.0	5.54	8.24
6	TX	HARLINGEN	0.0	10.10	5.91	7.11
6	TX	HOUSTON	25.00	11.10	6.55	8.65
6	TX	LAREDO	0.0	10.65	6.00	8.71
6	TX	LUBBOCK	0.0	11.04	5.57	7.53
6	TX	MCCALLEN	0.0	9.99	6.79	7.53
6	TX	MIDLAND	0.0	9.70	6.74	7.47
6	TX	ODessa	0.0	10.63	6.00	8.81
6	TX	PORT ARTHUR	0.0	10.63	5.79	7.21
6	TX	SAN ANGELO	0.0	9.71	6.74	7.47
6	TX	SAN ANTONIO	0.0	14.19	4.11	9.00
6	TX	SHEPHERD	0.0	8.70	6.86	7.20
6	TX	TEXARKANA	0.0	9.69	6.74	7.46
6	TX	TEXAS CITY	0.0	11.34	4.13	6.71
6	TX	TYLER	0.0	11.13	5.65	7.96
6	TX	WACO	0.0	12.39	3.90	6.98
6	TX	WICHITA FALL	0.0	10.16	6.63	7.89
6	TX	OTHER URBAN AREAS	19.78	12.33	4.48	7.98
6	TX	AVE. FOR STATE	19.78	12.33	4.48	7.98
6		AVE. FOR REGION	10.87	12.93	4.68	8.37

EPA RFG		STATE ID	URBANIZED AREA	DEVELOPED POPULATION DENSITY (PERSONS/ACRE)			
				COMB	STORM	UNSEW	AVER
7	IA	IA	CEAR RAPIDS	0.0	11.15	5.60	7.70
7	IA	IA	DAVENPORT	11.88	11.88	4.39	7.02
7	IA	IA	DES MOINES	26.42	9.86	4.99	7.90
7	IA	IA	DUBUQUE	0.0	9.98	3.54	7.95
7	IA	IA	SIoux CITY	0.0	13.10	7.76	7.22
7	IA	IA	WATERLOO	0.0	10.71	5.76	7.25
7	IA	IA	OTHER URBAN AREAS	28.38	9.85	4.81	7.61
7	IA	IA	AVE. FOR STATE	28.38	9.85	4.81	7.61
7	KS	KS	KANSAS CITY METRO	11.82	11.82	5.16	8.72
7	KS	KS	TOPEKA	12.12	12.12	4.91	8.04
7	KS	KS	WICHITA	0.0	11.20	5.59	8.41
7	KS	KS	OTHER URBAN AREAS	11.93	11.50	5.29	8.45
7	KS	KS	AVE. FOR STATE	11.93	11.50	5.29	8.45
7	MO	MO	COLUMBIA	0.0	12.62	3.85	7.05
7	MO	MO	KANSAS CITY	14.67	16.59	5.76	7.61
7	MO	MO	SPRINGFIELD	0.0	12.08	4.71	7.55
7	MO	MO	ST. JOSEPH	5.35	0.0	0.0	5.35
7	MO	MO	ST. LOUIS	9.72	0.0	9.53	9.64
7	MO	MO	OTHER URBAN AREAS	10.00	8.52	7.49	8.65
7	MO	MO	AVE. FOR STATE	10.00	8.52	7.49	8.65
7	NE	NE	LINCOLN	0.0	12.93	4.59	8.48
7	NE	NE	OMAHA	14.17	14.17	4.06	8.79
7	NE	NE	OTHER URBAN AREAS	14.17	13.41	4.19	8.71
7	NE	NE	AVE. FOR STATE	14.17	13.41	4.19	8.71
7			AVE. FOR REGION 7	11.46	10.57	5.92	8.37
8	CO	CO	BOULDER	0.0	12.91	4.93	10.55
8	CO	CO	COLORADO SPRINGS	0.0	11.20	5.58	7.84
8	CO	CO	DENVER	26.33	13.43	4.30	9.11
8	CO	CO	PUERLO	18.33	9.52	5.64	8.75
8	CO	CO	OTHER URBAN AREAS	19.93	12.84	4.66	8.93
8	CO	CO	AVE. FOR STATE	19.93	12.84	4.66	8.93
8	MT	MT	BYLLINGS	0.0	11.14	5.62	8.17
8	MT	MT	GREAT FALLS	0.0	10.12	6.26	8.76
8	MT	MT	OTHER URBAN AREAS	0.0	10.57	5.86	8.46
8	MT	MT	AVE. FOR STATE	0.0	10.57	5.86	8.46
8	ND	ND	FARGO	10.67	10.67	6.18	9.06
8	ND	ND	OTHER URBAN AREAS	10.67	10.67	6.18	9.06
8	ND	ND	AVE. FOR STATE	10.67	10.67	6.18	9.06
8	SD	SD	SIOUX FALLS	12.23	12.23	5.28	8.32
8	SD	SD	OTHER URBAN AREAS	12.23	12.23	5.28	8.32
8	SD	SD	AVE. FOR STATE	12.23	12.23	5.28	8.32
8	UT	UT	OGDEN	0.0	12.50	4.62	8.01
8	UT	UT	PROVO	0.0	13.10	3.76	7.22
8	UT	UT	SALT LAKE CITY	0.0	12.70	4.45	8.15
8	UT	UT	OTHER URBAN AREAS	0.0	12.72	4.37	7.98
8	UT	UT	AVE. FOR STATE	0.0	12.72	4.37	7.98
8	WY	WY	URBAN AREAS	0.0	11.16	5.62	8.16
8	WY	WY	AVE. FOR STATE	0.0	11.16	5.62	8.16
8			AVE. FOR REGION 8	15.90	12.24	4.88	8.56

TABLE III-8 DEVELOPED POPULATION DENSITY BY TYPE OF SEWERAGE SYSTEM

EPA RFG	STATE ID	URBANIZED AREA	DEVELOPED POPULATION DENSITY (PERSONS/ACRE)			
			COMB	STORM	UNSEW	AVER
9	AK	URBAN AREAS	13.75	13.75	3.66	7.50
9	AK	AVE. FOR STATE	13.75	13.75	3.66	7.50
9	AZ	PHOENIX	0.0	12.51	3.97	7.79
9	AZ	TUCSON	0.0	11.51	5.48	8.34
9	AZ	OTHER URBAN AREAS	0.0	12.26	4.32	7.92
9	AZ	AVE. FOR STATE	0.0	12.26	4.32	7.92
9	CA	BAKERSFIELD	0.0	13.23	4.40	8.67
9	CA	FRESNO	0.0	11.84	4.71	8.86
9	CA	LOS ANGELES	0.0	12.71	5.09	10.98
9	CA	MODesto	0.0	11.11	4.84	8.65
9	CA	OXNARD	0.0	11.11	4.84	7.76
9	CA	SACRAMENTO	12.49	12.49	5.21	8.14
9	CA	SALTNAS	0.0	11.25	5.05	7.69
9	CA	SAN BERNARDINO	0.0	14.00	5.00	8.48
9	CA	SAN DIEGO	0.0	13.00	5.68	9.96
9	CA	SAN FRANCISCO	26.06	13.00	5.98	9.66
9	CA	SAN JOSE	0.0	11.00	5.15	9.24
9	CA	SANTA BARBARA	0.0	11.00	5.15	9.05
9	CA	SANTA ROSA	0.0	9.00	7.11	7.56
9	CA	SEASIDE	0.0	9.00	5.44	9.42
9	CA	SIMI VALLEY	0.0	11.00	5.00	7.84
9	CA	STOCKTON	0.0	11.00	5.00	8.94
9	CA	OTHER URBAN AREAS	24.79	12.85	4.21	9.93
9	CA	AVE. FOR STATE	24.79	12.85	4.21	9.93
9	HI	HONOLULU	0.0	13.55	4.46	9.39
9	HI	OTHER URBAN AREAS	0.0	13.55	4.46	9.39
9	HI	AVE. FOR STATE	0.0	13.55	4.46	9.39
9	NV	LAS VEGAS	0.0	12.90	4.16	7.54
9	NV	RENO	14.33	10.84	5.25	8.18
9	NV	OTHER URBAN AREAS	14.33	12.50	4.46	7.72
9	NV	AVE. FOR STATE	14.33	12.50	4.46	7.72
9		AVE. FOR REGION 9	24.26	12.83	4.23	9.68
10	ID	BOISE	0.0	10.58	6.52	8.47
10	ID	OTHER URBAN AREAS	0.0	10.58	6.52	8.47
10	ID	AVE. FOR STATE	0.0	10.58	6.52	8.47
10	OR	EUGENE	12.05	12.05	4.93	8.08
10	OR	PORTLAND	13.06	13.06	4.44	8.62
10	OR	SALEM	0.0	11.11	5.67	8.06
10	OR	OTHER URBAN AREAS	13.04	12.57	4.64	8.50
10	OR	AVE. FOR STATE	13.04	12.57	4.64	8.50
10	WA	SEATTLE	12.74	12.74	4.54	8.53
10	WA	SPOKANE	8.48	0.0	8.48	8.48
10	WA	TACOMA	12.47	12.47	4.86	8.12
10	WA	OTHER URBAN AREAS	11.31	12.65	4.86	8.45
10	WA	AVE. FOR STATE	11.31	12.65	4.86	8.45
10		AVE. FOR REGION 10	11.82	12.29	4.94	8.46
		AVERAGE FOR THE U.S.	16.73	13.00	4.59	9.56

TABLE III-9 VALUES OF COEFFICIENTS

EPA RFG	STATE ID	URBANIZED AREA	VALUES OF COEFFICIENTS					
			a	a'	b	x <sub>1</sub>	x <sub>2</sub>	z
1	CT	BRIDGEPORT	57.7	75.5	-0.77	2.00	24.3	0.479
1	CT	BRISTOL	91.7	116.1	-1.06	2.00	15.4	0.596
1	CT	DANBURY	57.4	82.2	-1.06	2.00	29.9	0.724
1	CT	HARTFORD	94.3	112.7	-1.06	2.00	32.1	0.800
1	CT	MERTDEN	65.1	89.0	-1.06	2.00	11.2	0.693
1	CT	NEW BRITAIN	45.7	57.3	-0.61	2.00	34.5	0.410
1	CT	NEW HAVEN	55.6	71.2	-0.70	2.00	31.1	0.422
1	CT	NORWALK	66.5	85.3	-0.85	2.00	21.4	0.508
1	CT	STAMFORD	48.1	65.2	-0.72	2.00	23.0	0.496
1	CT	WATERBURY	57.6	76.1	-0.79	2.00	22.4	0.499
1	ME	LEWISTON	30.3	52.4	-0.91	2.00	10.8	0.776
1	ME	PORTLAND	92.9	119.7	-1.06	2.29	28.7	0.605
1	MA	BOSTON	231.8	256.9	-1.11	2.65	31.8	0.346
1	MA	BROCKTON	58.5	76.0	-0.77	2.00	24.7	0.474
1	MA	FALL RIVER	71.2	88.8	-0.79	2.00	29.3	0.424
1	MA	FITCHBURG	60.3	85.5	-1.06	2.00	10.4	0.712
1	MA	LAWRENCE	30.6	45.5	-0.61	2.00	22.3	0.531
1	MA	LOWELL	91.1	118.8	-0.93	2.00	24.4	0.457
1	MA	NEW BEDFORD	51.3	64.4	-0.61	2.00	44.8	0.351
1	MA	PITTSFIELD	67.5	92.3	-1.06	2.00	11.6	0.684
1	MA	SPRINGFIELD	32.3	48.8	-0.66	2.00	21.6	0.563
1	MA	WORCESTER	47.4	63.1	-0.68	2.00	27.1	0.458
1	NH	MANCHESTER	126.2	152.7	-1.08	2.33	28.0	0.524
1	NH	NASHUA	12.1	23.5	-0.41	2.00	22.4	0.621
1	RI	PROVIDENCE	108.6	129.9	-0.92	2.29	28.2	0.421
1	VT	URBAN AREAS	130.9	154.5	-1.08	2.00	22.9	0.495
2	NJ	ATLANTIC CITY	94.3	118.6	-1.06	2.00	15.8	0.588
2	NJ	NEW YORK CITY METRO	147.3	170.9	-1.11	2.00	21.1	0.478
2	NJ	PHILADELPHIA METRO	53.7	66.0	-0.61	2.00	64.7	0.335
2	NJ	TRENTON	54.9	67.1	-0.61	2.00	50.0	0.326
2	NJ	VINELAND	41.0	65.5	-1.06	2.00	7.2	0.794
2	NY	ALBANY	108.3	128.7	-0.93	2.05	26.9	0.425
2	NY	BINGHAMPTON	107.2	127.3	-0.93	2.00	45.7	0.426
2	NY	BUFFALO	113.7	127.6	-0.79	2.00	51.6	0.260
2	NY	NEW YORK CITY	299.7	327.6	-0.92	2.00	99.9	0.001
2	NY	ROCHESTER	203.0	223.7	-1.08	2.00	30.7	0.335
2	NY	SYRACUSE	67.0	81.4	-0.70	2.00	40.5	0.353
2	NY	UTICA	43.7	61.1	-0.72	2.00	20.1	0.529

TARIF III-9 VALUES OF COEFFICIENTS

EPA REF	STATE ID	URBANIZED AREA	VALUES OF COEFFICIENTS					
			a	a'	b	x <sub>1</sub>	x <sub>2</sub>	z
3	DE	WILMINGTON	59.5	74.9	-0.71	1.88	32.0	0.408
3	DC	WASHINGTON, D.C.	237.5	241.2	-0.75	1.83	96.2	0.038
3	MD	BALTIMORE	114.2	128.1	-0.79	2.00	51.9	0.258
3	MD	WASHINGTON DC METRO	107.0	124.2	-0.86	2.00	35.4	0.351
3	PA	ALLENTOWN	96.4	114.1	-0.85	2.00	32.9	0.377
3	PA	ALTOONA	54.8	66.6	-0.62	2.00	47.5	0.337
3	PA	ERIE	51.1	64.4	-0.61	2.00	45.5	0.338
3	PA	HARRISBURG	102.7	123.1	-0.93	2.00	25.5	0.489
3	PA	JOHNSTOWN	23.2	32.8	-0.41	2.00	42.2	0.440
3	PA	LANCASTER	35.6	49.1	-0.58	2.00	29.9	0.445
3	PA	PHILADELPHIA	106.0	118.5	-0.75	2.00	60.3	0.233
3	PA	PITTSBURGH	274.6	292.2	-1.17	2.00	18.3	0.333
3	PA	READING	53.4	65.8	-0.61	2.00	47.7	0.337
3	PA	SCRANTON	11.0	20.6	-0.34	2.00	27.3	0.579
3	PA	WILKES-BARRE	48.9	65.0	-0.72	2.00	33.3	0.410
3	PA	YORK	31.6	43.2	-0.51	2.00	35.3	0.414
3	VA	LYNCHBURG	13.0	22.6	-0.41	2.00	43.9	0.511
3	VA	NEAPORT NEWS	61.4	83.7	-0.93	2.00	15.9	0.568
3	VA	NORFOLK	112.6	137.0	-1.09	2.00	17.8	0.508
3	VA	PETERSBURG	118.9	142.0	-1.08	2.00	18.7	0.528
3	VA	RICHMOND	58.9	76.0	-0.77	1.84	24.7	0.637
3	VA	ROANOKE	30.6	45.5	-0.61	2.00	19.6	0.532
3	VA	WASHINGTON DC METRO	178.6	187.0	-0.79	2.00	88.0	0.120
3	WV	CHARLESTON	56.8	75.6	-0.72	2.07	21.8	0.508
3	WV	HUNTINGTON	73.4	87.6	-0.79	2.00	33.0	0.362
3	WV	STEUBENVILLE METRO	79.9	100.5	-1.11	2.00	38.5	0.614
3	WV	WHEELING	22.5	32.2	-0.41	2.00	30.0	0.414

TABLE III-9 VALUES OF COEFFICIENTS

EPA REG	STATE ID	URBANIZED AREA	VALUES OF COEFFICIENTS					
			a	a'	b	x <sub>1</sub>	x <sub>2</sub>	Z
444	AL	BIRMINGHAM	37	58	1	N	N	N
444	AL	GADSDEN	58	83	3	N	N	N
444	AL	HUNTSVILLE	68	94	4	N	N	N
444	AL	MOBILE	51	73	3	N	N	N
444	AL	MONTGOMERY	55	75	3	N	N	N
444	AL	TUSCALOOSA	13	26	1	N	N	N
444	FL	FT. LAUDERDALE	75	94	4	N	N	N
444	FL	GAINESVILLE	28	34	1	N	N	N
444	FL	JACKSONVILLE	86	111	1	N	N	N
444	FL	MIAMI	109	141	1	N	N	N
444	FL	ORLANDO	101	135	1	N	N	N
444	FL	DELFONSA	58	77	3	N	N	N
444	FL	ST. PETERSBURG	102	133	1	N	N	N
444	FL	TALLAHASSEE	62	77	3	N	N	N
444	FL	TAMPA	24	33	1	N	N	N
444	FL	WEST PALM BEACH	47	66	1	N	N	N
444	GA	ALBANY	36	45	1	N	N	N
444	GA	ATLANTA	21	24	1	N	N	N
444	GA	AUGUSTA	26	33	1	N	N	N
444	GA	COLUMBUS	55	77	3	N	N	N
444	GA	MACON	47	55	1	N	N	N
444	GA	SAVANNAH	60	79	1	N	N	N
444	KY	HUNTINGTON METRO	27	44	1	N	N	N
444	KY	LEXINGTON	51	63	1	N	N	N
444	KY	LOUISVILLE	13	33	1	N	N	N
444	KY	OWENSBORO	57	69	1	N	N	N
444	MS	BILOXI	24	39	1	N	N	N
444	MS	JACKSON	48	65	1	N	N	N
444	NC	ASHEVILLE	89	113	1	N	N	N
444	NC	CHARLOTTE	30	44	1	N	N	N
444	NC	DURHAM	55	77	3	N	N	N
444	NC	FAYETTEVILLE	59	77	3	N	N	N
444	NC	GREENSBORO	58	77	3	N	N	N
444	NC	HIGHPOINT	12	23	1	N	N	N
444	NC	RALEIGH	22	33	1	N	N	N
444	NC	WILMINGTON	99	140	1	N	N	N
444	NC	WINSTON-SALEM	77	102	1	N	N	N
444	SC	CHARLESTON	36	44	1	N	N	N
444	SC	COLUMBIA	66	90	1	N	N	N
444	SC	GREENVILLE	55	77	3	N	N	N
444	TN	CHATTANOOGA	31	41	1	N	N	N
444	TN	KNOXVILLE	94	124	1	N	N	N
444	TN	MEMPHIS	19	29	1	N	N	N
444	TN	NASHVILLE	96	131	1	N	N	N

TABLE III-9 VALUES OF COEFFICIENTS

EPA RFG	STATE ID	URBANIZED AREA	VALUES OF COEFFICIENTS						
			a	a'	b	x <sub>1</sub>	x <sub>2</sub>	γ	
U	IL	AURORA	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	IL	BLOOMINGTON	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	IL	CHAMPAIGN	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	IL	CHICAGO	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	IL	DAVENPORT METRO	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	IL	DECATUR	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	IL	JOLIET	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	IL	PEORIA	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	IL	ROCKFORD	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	IL	SPRINGFIELD	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	IN	ANDERSON	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	IN	CHICAGO METRO	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	IN	EVANSVILLE	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	IN	FORT WAYNE	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	IN	INDIANAPOLIS	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	IN	LAFAYETTE	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	IN	MUNCIE	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	IN	SOUTH BEND	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	IN	TERRA HAUTE	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	MI	ANN ARBOR	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	MI	BAY CITY	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	MI	DETROIT	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	MI	FLINT	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	MI	GRAND RAPIDS	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	MI	JACKSON	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	MI	KALAMAZOO	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	MI	LANSING	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	MI	MUSKEGON	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	MI	SAGINAW	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	MN	DULUTH	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	MN	FARGO METRO	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	MN	MINNEAPOLIS	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	MN	ROCHESTER	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	OH	AKRON	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	OH	CANTON	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	OH	CINCINNATI	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	OH	CLEVELAND	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	OH	COLUMBUS	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	OH	DAYTON	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	OH	HAMILTON	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	OH	LYMA	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	OH	LORAIN	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	OH	MANSFIELD	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	OH	SPRINGFIELD	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	OH	STEUBENVILLE	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	OH	TOLEDO	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	OH	YOUNGSTOWN	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	WI	APPLETON	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	WI	DULUTH METRO	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	WI	GREEN BAY	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	WI	KENOSHA	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	WI	LACROSSE	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	WI	MADISON	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	WI	MILWAUKEE	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	WI	ROSKOSH	1.00	1.11	1.11	1.11	1.11	1.11	1.11
U	WI	RACINE	1.00	1.11	1.11	1.11	1.11	1.11	1.11

TABLE III-9 VALUES OF COEFFICIENTS

EPA RFG	STATE ID	URBANIZED AREA	VALUES OF COEFFICIENTS					
			a	a'	b	x <sub>1</sub>	x <sub>2</sub>	7
666	AR	FORT SMITH	59.7	84.5	1.0	2.0	1.1	0.0
666	AR	LITTLE ROCK	11.6	19.5	1.0	2.0	1.1	0.0
666	AR	PINE BLUFF	27.6	39.5	1.0	2.0	1.1	0.0
666	LA	BATON ROUGE	46.4	61.5	1.0	2.0	1.1	0.0
666	LA	LAFAYETTE	29.6	41.5	1.0	2.0	1.1	0.0
666	LA	LAKE CHARLES	30.7	42.5	1.0	2.0	1.1	0.0
666	LA	MONROE	35.1	47.5	1.0	2.0	1.1	0.0
666	LA	NEW ORLEANS	33.6	45.5	1.0	2.0	1.1	0.0
666	LA	SHREVEPORT	28.5	42.5	1.0	2.0	1.1	0.0
666	NM	ALBUQUERQUE	57.5	75.5	1.0	2.0	1.1	0.0
666	OK	LAWTON	14.7	25.5	1.0	2.0	1.1	0.0
666	OK	OKLAHOMA CITY	91.3	116.5	1.0	2.0	1.1	0.0
666	OK	TULSA	68.0	90.5	1.0	2.0	1.1	0.0
666	TX	ARILENE	66.6	92.5	1.0	2.0	1.1	0.0
666	TX	AMARILLO	62.9	86.5	1.0	2.0	1.1	0.0
666	TX	AUSTIN	62.3	85.5	1.0	2.0	1.1	0.0
666	TX	BEAUMONT	82.4	108.5	1.0	2.0	1.1	0.0
666	TX	BROWNSVILLE	82.4	108.5	1.0	2.0	1.1	0.0
666	TX	BRYAN	82.4	108.5	1.0	2.0	1.1	0.0
666	TX	CORPUS CHRISTI	87.4	114.5	1.0	2.0	1.1	0.0
666	TX	DALLAS	240.6	316.5	1.0	2.0	1.1	0.0
666	TX	EL PASO	134.4	176.5	1.0	2.0	1.1	0.0
666	TX	FORT WORTH	91.1	116.5	1.0	2.0	1.1	0.0
666	TX	GALVESTON	32.9	46.5	1.0	2.0	1.1	0.0
666	TX	HARLINGEN	36.9	50.5	1.0	2.0	1.1	0.0
666	TX	HOUSTON	30.0	42.5	1.0	2.0	1.1	0.0
666	TX	LAREDO	30.0	42.5	1.0	2.0	1.1	0.0
666	TX	LIBROCK	25.0	40.5	1.0	2.0	1.1	0.0
666	TX	MCALLEN	16.1	22.5	1.0	2.0	1.1	0.0
666	TX	MIDLAND	23.1	32.5	1.0	2.0	1.1	0.0
666	TX	ODESSA	23.1	32.5	1.0	2.0	1.1	0.0
666	TX	PORT ARTHUR	20.0	26.5	1.0	2.0	1.1	0.0
666	TX	SAN ANGELO	20.0	26.5	1.0	2.0	1.1	0.0
666	TX	SAN ANTONIO	12.9	17.5	1.0	2.0	1.1	0.0
666	TX	SHERMAN	10.0	14.5	1.0	2.0	1.1	0.0
666	TX	TEXARKANA	12.7	17.5	1.0	2.0	1.1	0.0
666	TX	TEXAS CITY	12.7	17.5	1.0	2.0	1.1	0.0
666	TX	TYLER	4.7	6.5	1.0	2.0	1.1	0.0
666	TX	WACO	2.7	3.5	1.0	2.0	1.1	0.0
666	TX	WICHITA FALL	1.7	2.5	1.0	2.0	1.1	0.0

TABLE III-9 VALUES OF COEFFICIENTS

EPA REG	STATE ID	URBANIZED AREA	VALUES OF COEFFICIENTS					
			a	a'	b	x <sub>1</sub>	x <sub>2</sub>	z
7	IA	CEDAR RAPIDS	27.4	42.6	0.61	0.00	0.00	0.00
7	IA	DAVENPORT	45.7	68.3	0.93	0.00	0.00	0.56
7	IA	DES MOINES	88.0	137.7	0.41	0.00	0.00	0.53
7	IA	DUBUQUE	75.5	100.2	0.41	0.00	0.00	0.54
7	IA	STOUIX CITY	45.4	68.2	0.61	0.00	0.00	0.40
7	IA	WATERLOO	21.1	36.2	0.61	0.00	0.00	0.64
7	KS	KANSAS CITY METRO	51.4	66.7	0.68	0.00	0.00	0.42
7	KS	TOPEKA	46.3	64.2	0.73	0.00	0.00	0.16
7	KS	WICHITA	35.5	49.4	0.60	0.00	0.00	0.46
7	MO	COLUMBIA	66.2	91.0	0.06	0.00	0.00	0.81
7	MO	KANSAS CITY	44.1	38.0	0.73	0.00	0.00	0.68
7	MO	SPRINGFIELD	24.7	64.5	0.58	0.00	0.00	0.33
7	MO	ST. JOSEPH	28.6	34.4	0.83	0.00	0.00	0.60
7	MO	ST. LOUIS	36.0	56.1	0.91	0.00	0.00	0.33
7	NE	LINCOLN	63.4	80.4	0.79	0.00	0.00	0.58
7	NE	OMAHA	83.7	128.3	0.93	0.00	0.00	0.42
8	CO	BOULDER	102.6	116.3	0.77	0.00	0.00	0.27
8	CO	COLORADO SPRINGS	29.3	44.3	0.61	0.00	0.00	0.46
8	CO	DENVER	119.5	140.9	0.61	0.00	0.00	0.25
8	CO	PIEBLO	38.2	51.4	0.83	0.00	0.00	0.85
8	MT	BILLINGS	32.0	46.2	0.59	0.00	0.00	0.49
8	MT	GREAT FALLS	32.0	45.1	0.51	0.14	0.00	0.24
8	ND	FARGO	22.5	30.7	0.41	0.50	0.00	0.39
8	SD	STOUIX FALLS	31.7	43.3	0.59	0.97	0.00	0.47
8	UT	OGDEN	57.2	76.3	0.81	0.00	0.00	0.50
8	UT	PROVO	75.4	100.3	0.86	0.00	0.00	0.50
8	UT	SALT LAKE CITY	72.1	93.1	0.86	0.23	0.00	0.44
8	WY	URBAN AREAS	31.7	46.0	0.59	2.00	0.00	0.50

TABLE III-9 VALUES OF COEFFICIENTS

EPA REF	STATE ID	URBANIZED AREA	VALUES OF COEFFICIENTS					
			a	a'	b	x <sub>1</sub>	x <sub>2</sub>	Z
9	AK	URBAN AREAS	90.2	114.7	-1.06	2.00	15.2	0.601
9	AZ	PHOENIX	130.6	164.9	-1.09	3.22	20.9	0.554
9	AZ	TUCSON	43.8	47.2	-0.60	1.63	2.9	0.75
9	CA	BAKERSFIELD	81.9	100.8	-0.85	0.00	0.00	0.44
9	CA	FRESNO	100.7	116.2	-0.80	0.00	0.00	0.41
9	CA	LOS ANGELES	100.7	116.2	-0.80	0.00	0.00	0.41
9	CA	MODESTO	72.0	94.5	-0.93	0.00	0.00	0.33
9	CA	OXNARD	72.6	94.7	-0.93	0.00	0.00	0.33
9	CA	SACRAMENTO	69.7	90.0	-0.85	0.00	0.00	0.31
9	CA	SALINAS	53.3	66.5	-0.61	0.00	0.00	0.26
9	CA	SAN BERNARDINO	100.0	126.6	-1.00	0.00	0.00	0.30
9	CA	SAN DIEGO	80.0	98.8	-0.84	0.00	0.00	0.30
9	CA	SAN FRANCISCO	63.8	76.6	-0.41	0.00	0.00	0.11
9	CA	SAN JOSE	117.6	136.5	-0.92	0.00	0.00	0.32
9	CA	SANTA BARRARA	45.8	55.9	-0.41	0.00	0.00	0.09
9	CA	SANTA ROSA	13.3	14.5	-0.41	0.00	0.00	0.09
9	CA	STASIDE	16.3	17.5	-0.41	0.00	0.00	0.09
9	CA	STMY VALLEY	7.7	8.1	-0.58	0.00	0.00	0.07
9	CA	STOCKTON	44.3	57.8	-0.61	0.00	0.00	0.05
9	HI	HONOLULU	100.8	118.1	-0.85	0.00	0.00	0.36
9	NV	LAS VEGAS	65.0	87.3	-0.91	0.00	0.00	0.28
9	NV	RENO	29.1	40.3	-0.53	0.00	0.00	0.19
10	ID	BOISE	16.5	25.0	-0.37	0.84	2.9	0.459
10	OR	EUGENE	47.8	65.3	-0.73	0.00	0.00	0.11
10	OR	PORTLAND	82.9	102.4	-0.85	0.13	0.22	0.44
10	OR	SALEM	29.9	44.0	-0.58	0.00	0.00	0.13
10	WA	SEATTLE	78.0	97.8	-0.84	0.25	0.7	0.451
10	WA	SPOKANE	47.6	63.3	-0.68	0.00	0.00	0.07
10	WA	TACOMA	57.5	76.1	-0.79	0.00	0.00	0.05

## ABBREVIATIONS AND SYMBOLS

a	Coefficient
a'	Adjusted coefficient
A	Total area of urbanized area, acres
b	Coefficient
C	Urban area with computed population density
E	Urban area with estimated population density
P	Population of urbanized area
P <sub>c</sub>	Population served by combined sewer system, persons
P <sub>s</sub>	Population served by storm sewer system, persons
P <sub>u</sub>	Unsewered population, persons
PD	Gross population density, persons per acre
PD <sub>x<sub>1</sub>-x<sub>2</sub></sub>	Average population density in interval from x <sub>1</sub> to x <sub>2</sub> , persons per acre
PD <sub>calc</sub>	Calculated average population density, persons per acre
PD <sub>d</sub>	Population density in developed portion of urban area, persons per acre
r	Correlation coefficient
x	Percent of urbanized area
x <sub>1</sub>	Calibrated lower limit on x such that average PD corresponds to the integrated average PD
x <sub>2</sub>	Calibrated upper limit on x such that average PD corresponds to the integrated average PD and percent of urban area which is sewerred
x <sub>c</sub>	Combined sewer area as percent of urbanized area
x <sub>u</sub>	Undeveloped area as percent of urbanized area
Z	Proportion undeveloped area

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